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Last Year's Statistics

The British Iron and Steel Federation Statistics of the Iron and Steel Industry for the United Kingdom for 1951* have included many figures germane to the foundry industry. The book discloses that the steelfoundry industry melted 483,800 tons of liquid steel in order to produce 269,700 tons of castings. Thus the yield of castings was 56 per cent. Of the quantity melted, 108,700 tons were alloyed and produced 61,400 tons of castings giving similar yield. The output figures are a record since 1948. There has been some increase in employment over the last few years and as the figure is now of the order of 19,000, the production is equivalent to 14.2 tons per man/year.

The production of iron castings was 3,752,500 tons which figure included 142,600 tons of malleable. (This latter figure shows a good increase of 13,100 tons over 1950.) To produce this record output, 5,326,000 tons of iron were melted, which gives a yield for the whole industry of about 70 per cent. The industry has been employing 150,730 people, about 4,800 more than 1950. Thus the production is 25 tons per man/year. Increased production is shown in nearly every section of the industry except iron- and steel-works plant, carriage and wagon castings and radiators. Notable amongst the increases in the use of raw materials is the higher percentage of steel scrap now being used.

All this makes fairly dry reading, but the figures referred to do give an overall picture of the ferrous foundry industry. The percentages we have worked out must be applied with discretion, as the complexity or simplicity of the castings made markedly influence the ratios of castings sold to the metal melted for their production and the quantity of castings made per man/year. Though no figures are available for the production of castings per square yard of foundry area, this too is an illusory figure—again owing to the complexity of the production. The striking difference between steel and iron man/year production is easily understandable, and the figures for the latter are weighted with the production of such items as spun pipes, where the yield is remarkably high. For some of the most delicate iron castings, the yield will be no better than for the average steel casting. The report includes information as to the number of furnaces, including electric, engaged in the industry. For electric furnaces, the list, totalling 198, specifically excludes the very numerous ones making "tool and special-quality steel." This type of production is rapidly growing, and very soon will be worthy of statistical inclusion. We recommend those of our readers who are interested in statistics and economics to purchase this Statistical Year Book, for in the 98 tables contained there are data on every phase of iron and steel production, export and import and similar subjects.

* Price 7s. 6d. from Steel House, Tothill Street, London, S.W.1.

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Notes from the Branches

Londoners Visit to Paris

Over a long weekend (June 26 to July 1) a party of over 40 members and guests of the London branch of the Institute of British Foundrymen visited their confrères of the French foundrymen's associations at the invitation of the *Association Technique de Fonderie* and the *Centre Technique de Fonderie*. The purpose was to visit foundries in the Paris area,* to investigate the set-up for training apprentices for the French foundry industry, and to view the new headquarters and laboratories of the *Centre Technique* and study the manner in which they are organized to serve French founders. All these objectives were well realized, and it is hoped shortly to publish reports summarizing some of the findings of the team. There is little doubt that in the relations between the technical foundry authority in France and the application of the findings in the works, British founders have much to learn from their friends across the Channel.

Two parties, one by air and the other by the train/sea route, left London on June 26, and on arrival in Paris were welcomed by Mr. Guy Hénon and Mr. Delpuech (who had organized the visit at the French end) respectively, before proceeding to the hotel where practically the whole party was accommodated. On the Friday morning the Renault foundries at Billancourt were visited, and the party returned to Paris for luncheon, where Mr. Muguet, president of the *Association Technique*, was present to welcome the delegates to Paris. Next there was a visit to the foundry of the Cie Française des Bronzes Phosphoreux Montefiore at St. Denis, and the evening was free.

French Training Measures

The Saturday morning was taken up by a visit to the headquarters of the *Association Technique* at 2, Rue de Bassano, Paris, and a lecture on the organization and structure of the French foundry industry. The latter was delivered by Mr. Debar, following an introduction and welcome by Mr. Waeles, immediate past-president of the Association, who explained the general scheme of pre- and post-apprenticeship training envisaged by the French. Mr. Debar, secretary general and supervisor of the vocational technical training, also outlined the ideas behind the production of the films which were subsequently shown. Initially, he said it was necessary to try to take a would-be entrant to the industry to see the sort of place where he would live. Then there would follow technological films to direct and implement the work done by the apprentice—such as films on non-metallic materials (exhibited) and others on metal and metal handling devices. Animated drawings and charts were incorporated.

After the showing of the new film "*Avec le Feu Sacré*," which was undoubtedly superior to any yet produced for a similar purpose in this country, there was a short discussion, and general views on training and recruitment were exchanged. It was clear that France is faced with similar problems to ours in recruitment, but appears to be tackling them on a national basis in a much more painstaking and thorough fashion. Subsequently, lists of literature available for aiding training were distributed, and other handbooks and instruction leaflets were inspected. The visitors were much impressed by a rendering by youths' voices of an anthem, "March of the Founders," which had been composed specially for foundry apprentices to help to establish morale and *esprit de corps*.

Afterwards, there was a reception given to the British group in another part of the building jointly by the *Commission Nationale de Formation Professionelle du Syndicat General des Fondeurs de France* and the *Centre Technique*. Representatives of the French government and from the British Embassy in Paris were also present. Here the delegates were received by Mr. Pinay, director general.

The Saturday afternoon and Sunday were free of official engagements, and were employed by most of the party for a sight seeing tour of Paris and a trip to Fontainebleau, respectively. Near the latter place, the birthplace of Millet, the celebrated French artist at Barbizon, was inspected. Then, following a works visit on Monday morning to the Fonderies Montupet at Nanterre, the afternoon was occupied by a visit to the head office of the *Centre Technique des Industries de la Fonderie* at 12, Avenue Raphael, Paris, and the newly-opened laboratories of the *Centre Technique* at Sèvres. At the *Centre*, the set-up of the French technical foundry research and development service was reviewed. It is hoped to describe and illustrate this in the JOURNAL in the near future. On the Tuesday morning the train/sea party left Paris en route for London, and the second party, travelling by air, returned the same evening. Both parties expressed extreme satisfaction with the technical and social facilities provided by the French organizations, and accorded a particular vote of thanks to Mr. A. R. Parkes, assistant secretary of the branch, who had organized the visit.

* See page 39 of this issue.

Applications of Synthetic Resins

This week, our representative was the guest of the technical services department of the Plastics Division of Imperial Chemical Industries, Limited, Welwyn Garden City. Here, there is installed a complete service for perfecting the raw materials they make for use by the foundry industry. Synthetic resins are making great progress in this country where the total consumption of core-compounds was stated to be of the order of 30,000 tons per annum.

Much of what was shown was common knowledge to our readers, but several applications were quite novel. One of these was the development of core carriers for use with di-electric drying. These are made from a polyester resin mixed with sand and glass fibre or glass fabric. Apparently, on electric and other grounds, metal carriers are unsuitable. Those made from this sand/resin mixture are dimensionally stable, robust, easy to make, and have good surface detail. In appearance, except for the marbling effect where glass fibre is used, they resemble the well-known pattern-stone. A second development was the suggested spraying of green-sand moulds with U.F. resin carrying an accelerator. This will harden within an hour at normal temperature, or immediately if subjected to "skin-drying" procedure. A case-hardened, permeable surface to green-sand moulds or cores is certainly a matter showing potentialities and technical interest.

The shell-moulding process was demonstrated, and some moulds and castings made commercially were exhibited. An extremely finely powdered U.F. resin is used, which is capable of rapid softening and almost equally rapid hardening after placing on a pattern-plate heated to 175 to 260 deg. C. The mixture contains 6 to 8 per cent. of resin. The opinion was expressed that shell moulding has a distinct future as a quantity-production process. The great drawback of resin bonding for coremaking was the inherent stickiness. It is being gradually overcome, but the most difficult problem is its use for the making of extruded cores by the "sausage-type" machine. The blowing of cores was stated to have been satisfactorily solved.

Manufacture of High-quality Steel Castings at an Economic Price*

By J. J. Dewez, Ingénieur Civil des Mines A.I.Br.

The main purposes of this Paper are to substantiate the fields of application of steel castings and to try to extend their possibilities by fulfilling the requirements of modern construction. The following points will be studied in relation to the manufacture of steel castings:—(1) Co-operation between the drawing office; engineer and foundryman at the design stage; (2) the question of quality of articles produced in every respect, namely: internal and external soundnesses, composition and heat-treatment of the steel, dimensions, shape and machining allowances; (3) control of every operation during and after manufacture from the methods department to the final checking; (4) the question of the cost of all operations; and (5) the human aspects of the question in relation to the quality of the men employed. The final justification will be found if an improvement is effected as important as the one which has taken place over the last 10 years, and steel castings are considered to be the most reliable and economical material for many purposes.

Steel foundry executives are faced to-day with new problems and difficulties to meet the requirements of current developments. In order to reduce the weight of the components and to save material, the average thickness of steel castings has a decided tendency to decrease. This fact alone is a great problem which compels the foundry technician to take more care to ensure external soundness, to use special steels and special heat-treatment and to consider more and more all the scientific aspects of his everyday work. Foundry executives who have been in the industry for 25 yrs. or more have had the privilege of seeing the time when the old foundry foreman was the unquestionable dictator replaced by the period of scientific control. This development over the last ten years has introduced into the steel foundry a large amount of scientific knowledge, instruments and machines, by way of giving foundry executives the necessary tools to reproduce most accurately the same conditions in every mould. That fact alone is responsible for the replacement of the old foundry foreman, with all his so-called foundry secrets in a small pocket-book, by the methods and control department of an up-to-date steel foundry, backed-up by an efficient chemical, physical and research laboratory.

Design

The first step for the manufacture of steel castings of high quality at a competitive price is the designing of the casting itself. Very few draughtsmen have an accurate knowledge of patternmaking, moulding, coremaking, core-setting, closing or pouring operations. The physical and chemical laws governing the interaction between sand and metal, the solidification of the steel and the cooling of the casting must also be very well understood by the designer. All the draughtsmen in the drawing office of a steel foundry must know all these important principles and must spend part of their time in the methods department, the inspection department and the non-destructive-testing department of the foundry. After that, they will be able to design properly so as to produce steel castings which will turn out sound, without special and intricate feeding and moulding devices, and, by so doing, they will improve the quality and decrease the cost of the castings. They also will be able to induce customers to change their own drawings to provide the foundry with better designs from which to produce castings.

It is a common occurrence in a steel foundry to find castings so badly designed that they bring into their manufacture numerous troubles. The cost of those castings is then very high compared with others which have been designed to take into account all the peculiarities of steelfounding. The percentage of rejected castings is sometimes disastrous due solely to faulty design. For instance, the radius of fillets compared to the thickness of the casting is very important in order to avoid external cracks or hot-tears which sometimes are detected only by magnetic tests. These cracks are due to the Williams' effect which takes place alongside the superheated sand corner of the fillet.

Holes in the wall of a steel casting should always be shaped as shown in Figs. 1 and 2. The sharp edges (Fig. 3) are very often responsible for the starting points of cracks developing after the casting has been put into service. Sudden changes of sections, serious differences in the thickness of walls and webs are responsible for internal stresses which will be the cause of cracked castings. The designer must also realize the tendency of the castings to warp by cooling and by good balancing of shapes and the addition of strengthening ribs he will be able to help a great deal in that respect.

The rather new and interesting way of feeding steel castings by the Williams' riser has helped in a large measure to provide sound castings despite the location of masses of metal in difficult-to-feed places, but the principle of application of atmospheric risers must be well understood in order to enable the designer to design the castings accordingly. If he is used to think of the best way of

* Paper presented to the Buxton Conference of the Institute of British Foundrymen as the Official Exchange Paper from *l'Association Technique de Fonderie de Belgique*. The Author is works manager of the Usines Emile Henricot Sté Ame Court-Saint-Etienne, Belgium.

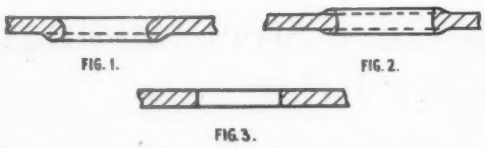

FIG. 1. FIG. 2.

FIG. 3.

FIGS. 1 TO 3.—*Holes in the Walls of a Steel Casting should be as shown in Section in Fig.* 1 *or Fig.* 2, *and* not *as in Fig.* 3.

moulding when designing a casting, the parting line of the pattern will be easy to find and a quantity of cores will be avoided. If the designer is aware of the fact that the steel casting must be so designed to cool down from pouring temperature to normal temperature as much as possible isothermally he will avoid concentrations of masses of metals and he will use a tubular construction instead of a T-shaped construction.

Drawing-office Co-operation

Cordial co-operation between the technicians of the drawing office and the foundry staff will replace built-up assemblies and welded structures by steel castings so ideally designed that they will be very cheap to mould and fettle and at the same time, sometimes lighter and always stronger than the former way of construction. The external and internal investigations on the sample casting will finalize the small details of the design. By the application of the loads imposed in service on that sample casting on a testing machine (press), the weakest points will be discovered. In that respect, the use of extensometers and strain-guages will help also in finding and suppressing the location of concentrated stresses and the even flow of the load to the supports will be found after a few trials (see Fig. 4).

It is easy to understand that co-operation of such a nature must give outstanding results. The best example to be cited as an illustration is the design and manufacture in large masses of the integral side-frames and bolsters for two-axle bogies for wagons. That has also been done for the manufacture of large bogie-frames for passenger coaches, sleeping cars, electric locomotives and tenders with wall thicknesses down to even below ½ in. The mass production of cast underframes for coal-mine cars and cast metal stanchions for mines has been made possible by such a co-operation and these have proved to be economical propositions.

A new field is to be investigated in the manufacture of large and intricate steel castings by composite construction. By welding cast-steel components together with plate and constructional steels, it will be possible to reduce the cost because the moulding of these cast-steel components can be done on moulding machines. This requires from the point of view of the designer a new experience, and from the point of view of the foundry engineer, the manufacture of thin castings with sound and weldable webs.

Paramount Importance of Quality

Quality the first consideration must be the slogan

FIG. 4.—*Extensometer Equalizing Beam for Checking Stresses by means of the Strain-gauge Technique.*

of the modern and progressive steel foundry. The quality of steel castings depends so much on the care of everyone concerned that it is necessary to survey, to control, and to check every operation by the best possible method in order to reproduce most accurately the conditions which have proved by experience to give the best results. The great number of operations involved, the large amount of working hours per ton required, the very high pouring temperature of the metal, the great difference of density between sand and metal are some of the conditions which make the job a difficult one. It is only by continuous control from the making of the pattern to the finished product that the best quality will be attained and this will prove finally to be the cheapest method of production. Any bad casting found in the machine-shop of the customer and especially a quantity of similar castings showing the same defect at the same place do more harm to the industry than its true competitors:—welded construction, forging, stamping, pressing, malleable iron and nodular iron. There are still too many customers who consider steel castings as an easy method of construction but not reliable for the most important parts of machine assemblies or equipment and this is due only to faulty castings which are delivered to them by steel foundries which do not undertake control and inspection.

It is a common practice to add more *material allowance for machining* on the top surface of a steel casting in order to ensure a clean surface on the casting after the removal of the extra material plus the normal allowance. It is also a common practice to cast the hubs of gears, of wheels and pulleys with a tapered core. When those castings are sent, the customer complains about the extra material he has to machine off, the extra weight for which he has to pay and the destruction of tools for the machining of these (very often) unsound layers of metal. Moreover, one must consider that these machine-shops have not in most cases sufficiently-powerful machine tools to remove economically this extra material. It must be done by the steel foundry itself for two main reasons:—

(1) The steel foundry is or should be equipped with machine-tools for rough machining to be able to deliver to the customer castings with normal machining allowances;

(2) The parts of the castings where defects are more likely to take place must, for ordinary steel, be rough-machined by the foundry before annealing, and before final treatment, for special steels, in order to mend such as are repairable defects which will be disclosed. At the same time, the foundry executive is able to see in his own machine-shop the most dangerous surfaces of his steel castings every day and correct his method of making them if necessary. Any claim from a customer must be dealt with immediately and experience must be gained from it in order to avoid similar defects in the future and improve the quality.

Methods Department

The *reports of the methods department* must be so made that every trouble found during the manufacture of any steel castings and every customer's claims can be made available to everyone concerned when a similar job is to be made, even after many years. The *choice of the correct chemical composition* of carbon and alloyed steels and of the correct heat-treatment to apply in order to give the metal the physical properties necessary to withstand the conditions in which the steel casting is going to work during its life, is of course a very important question. Here again, experiences, good or bad, are equally important to help progressive steelfoundrymen to give their customers the best material for the purpose required. In that respect, it is important to train technicians to visit the customers, not for booking new orders, but to inquire carefully about the way in which delivered steel castings are standing the load and conditions of their everyday work. Inspection of steel castings delivered sometimes a long time ago is the best way to give customers a good service as well as confidence in the products of the steel foundry.

It must be the continuous care of steel foundry executives to improve the quality of their products all the time, by inducing their staff and workmen to think always of " quality first." It takes a very long time before significant achievements are made in this direction and it is very difficult to keep this state of mind in time of over production, but it must be kept at all cost. In that respect, it is sometimes necessary to scrap a quantity of steel castings which could be repaired in order to remind the foundry people that quality is of primary importance. It is primarily by quality that the progressive steel foundry will defend with complete success the fields of application of steel castings in modern engineering and industry.

Control

In most steel foundries there are a number of steel castings which do not come out properly and which give the fettling shop much trouble. Too many working hours are too often spent for the reconditioning of castings. Alloyed steel castings are always difficult, and sometimes impossible, to repair. The costs of reconditioning are always substantial and sometimes unsupportable and have very seldom been envisaged in the estimation of the price and there is consequently not only a lack of profit, but very often a real loss on the order. Furthermore, the percentage of rejected castings is in those cases very high. The reason is always the same: lack of control somewhere in the foundry itself. Control is therefore the best way to decrease the cost of steel castings and at the same time it improves their quality.

The first control must be made on the drawings, and corrections of shapes and dimensions must be asked from the customer by the methods and control department in order to avoid difficulties in manufacture. The study of the moulding, the gating and the feeding of the castings must be completed and put on record before ordering the pattern, which must be completely detailed on sketches and perspective designs for the patternmaker, with indications and dimensions of gates and risers, parting line, dimension of prints, machining allowances, increase in wall-thicknesses, shrinkage rates in various directions, design of coreboxes and so on. Nothing must be left to the more or less clever improvization of the patternmaker or the moulder. The casting must be thoroughly thought-out in the methods department and not cured in the fettling shop. All these documents can be sent to the patternshop and to the foundry floor in cellophane paper bags to keep them clean. Incomplete studies will have to be paid for by many working hours to repair the damage done.

The coreboxes are drawn in perspective in order to show those on the foundry floor the number, the size and the shape of the different chill and gaggers necessary to make one set of cores. Each corebox is sent to the coreshop with complete sets of chills and gaggers, thus avoiding loss of time for the coremaker. The following pictures illustrate the principles of this method of organization:—Fig. 5, Fig. 6*a* and 6*b*, Fig. 7*a* and 7*b*, Fig. 8, Fig. 9.

Sample Casting

The sample casting is made in accordance with the recorded study of the methods department, which is, therefore, a basis for the modification of any detail in case defects or imperfections have been found on the sample. Any other method based, for instance, on the memory of the foreman or the moulder will prove to be a failure because nobody can remember all the details of even a simple mould after a few days. The temperature of the metal used, and the exact time required for pouring of heavy castings, should be reported to the methods department. The control of the sample casting in every respect is, of course, a most important one. It must include the control by checking of the dimensions, of the eventual distortion of the castings, the control of external soundness visually and with the magnetic test, the control of internal soundness with X-rays and gamma rays. After heat-treatment, the Brinell hardness should be taken and eventually a static test or a pressure test should be applied at twice the load or twice the pressure in service.

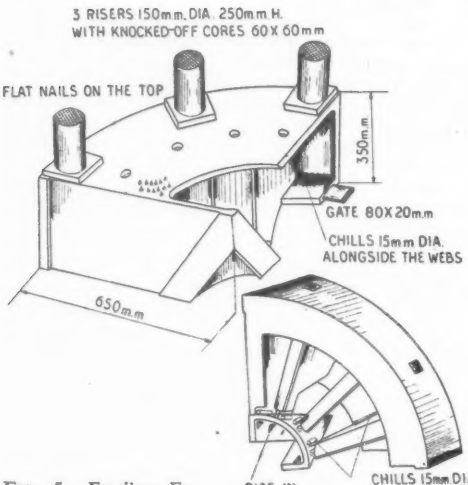
3 RISERS 150m.m. DIA. 250m.m H.
WITH KNOCKED-OFF CORES 60 X 60m.m
FLAT NAILS ON THE TOP
350m.m
GATE 80X20m.m
CHILLS 15m.m DIA.
ALONGSIDE THE WEBS
650m.m
RIBS IN CORNERS 4X10X10m.m.
CHILLS 15mm DIA ALONGSIDE WEBS EXCEPT UNDER THE RISERS

FIG. 5.—*Feeding Entrance in Four Pieces for Cement Ball-mill (Cr/Mo Steel).*

By weighing the sample casting and the gates and risers, the amount of liquid metal necessary to pour it and the weight of the casting itself will be compared with the figures which have been calculated to compute the cost price. The fettling shop should also report to the methods department any difficulties which they have encountered during the fettling of the sample casting. All these controls are of primary importance and any modification made to remedy an imperfection must be recorded and checked again until the sample casting is reported to be satisfactory in every respect. Only then can the manufacture in series be safely started. Skilled workmen in every department must take care of the sample castings to rush them through the plant in order to report quickly and accurately to the methods department. The only thing which remains after that is to reproduce accurately for every casting *all the conditions* in which the good sample castings have been produced. This requires a network of analysis and controls of the raw materials used and of their handling in the production of the molten metal as well as in the making of the moulds.

Melting Plant

In the melting plant, the control starts with the analysis of the raw materials: pig-iron, scrap, ferro-alloys, refractory materials, etc. The laboratories follow the melting operations closely and give the melter valuable data about the composition of the charges. Temperatures are taken by immersion thermocouples at important points of the operation, namely: after complete melting, before slagging off, before tapping, and in the ladle. Optical pyrometers give the temperatures at the start, in the middle, and near the end of the pouring operation. Test-pieces which have been taken

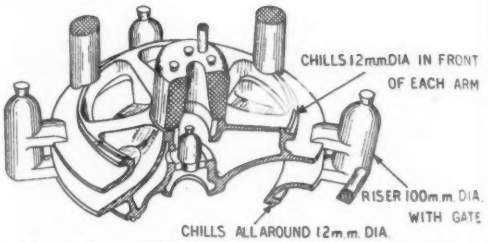

FIG. 6(*a*). POURING TEMPERATURE 1,470 DEG. C. BY OPTICAL PYROMETER.

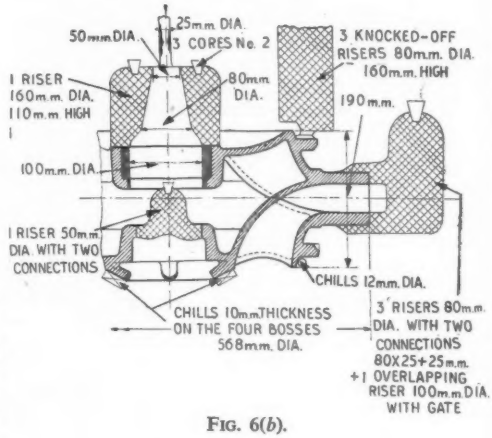
50mm DIA.
25m.m. DIA.
3 CORES No. 2
3 KNOCKED-OFF RISERS 80m.m. DIA. 160m.m. HIGH
1 RISER 160m.m. DIA. 110m.m HIGH
80mm DIA.
190m.m.
100m.m. DIA.
1 RISER 50mm DIA WITH TWO CONNECTIONS
CHILLS 12mm. DIA.
CHILLS 10mm THICKNESS ON THE FOUR BOSSES 568mm. DIA.
3 RISERS 80m.m. DIA. WITH TWO CONNECTIONS 80X25+25m.m. +1 OVERLAPPING RISER 100m.m DIA. WITH GATE

FIG. 6(*b*).

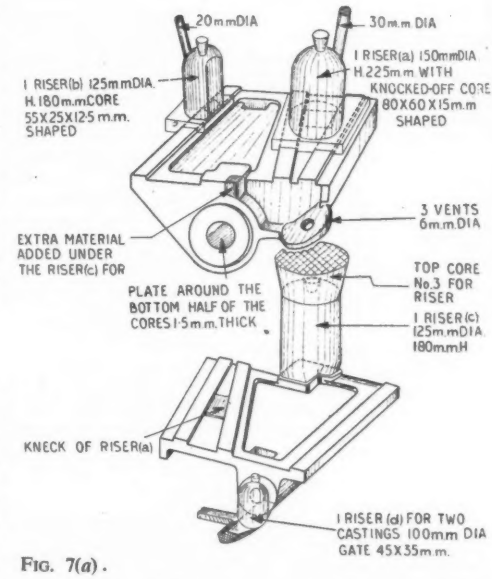
20mm DIA
30m.m DIA
1 RISER(a) 150mm DIA H.225m.m WITH KNOCKED-OFF CORE 80X60X15m.m SHAPED
1 RISER(b) 125mm DIA. H.180m.m CORE 55X25X125 m.m. SHAPED
3 VENTS 6m.m DIA
EXTRA MATERIAL ADDED UNDER THE RISER(c) FOR
TOP CORE No.3 FOR RISER
PLATE AROUND THE BOTTOM HALF OF THE CORES 15m.m. THICK
1 RISER(c) 125m.m DIA 180m.m H
KNECK OF RISER(a)
1 RISER (d) FOR TWO CASTINGS 100mm DIA GATE 45X35m.m.

FIG. 7(*a*).

FIGS. 6 TO 9.—*Various Examples of Job Layout, Feeding and Risering Techniques at the Works of the Author.*

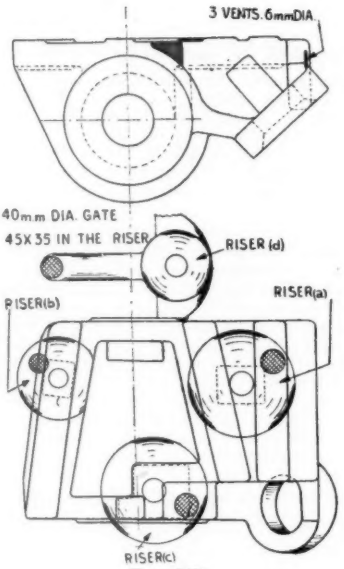

FIG. 7(*b*).

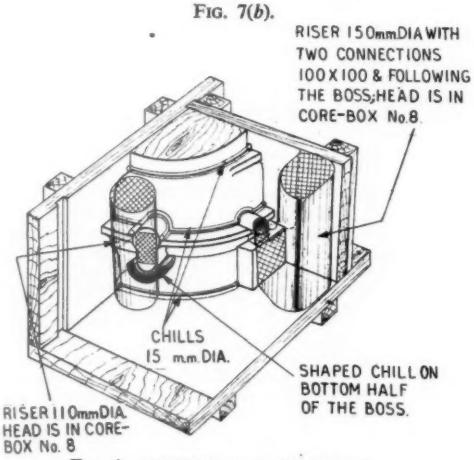
RISER 150mm DIA WITH TWO CONNECTIONS 100X100 & FOLLOWING THE BOSS; HEAD IS IN CORE-BOX No. 8
CHILLS 15 mm DIA.
SHAPED CHILL ON BOTTOM HALF OF THE BOSS.
RISER 110mm DIA. HEAD IS IN CORE-BOX No. 8

FIG. 8. COREBOX No. 14. SAND No. 5

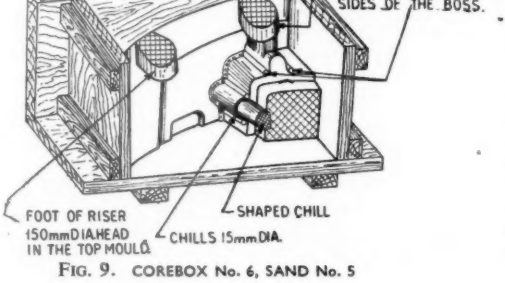
FOOT OF RISER 150mm DIA. HEAD IN THE TOP MOULD WITH TWO CONNECTIONS
CHILLS 15mm DIA ON BOTH SIDES OF THE BOSS.
FOOT OF RISER 150mm DIA. HEAD IN THE TOP MOULD
SHAPED CHILL
CHILLS 15mm DIA.

FIG. 9. COREBOX No. 6, SAND No. 5

from the ladle are sent immediately to the laboratories, and the final analysis of the metal is known before the castings are even shaken out of the boxes. If something goes wrong after the last analysis in the furnace, it will be possible to find out and mark all the castings which have been cast with that special charge and scrap them if necessary, or give them all appropriate heat-treatment (quenching and tempering) so that those castings may have the required physical properties. Here again quick control will save money.

Test-pieces are also heat-treated by the laboratories and tested for their physical properties in order to give the heat-treatment department exact figures as to the best results they can expect from the heat. All those results constitute very valuable statistics when they are put on record for the different grades of metals. Standard quality can be kept and it is possible to compare easily results obtained by some changes in the process with the average quality of the metal generally obtained.

Notched-bar shock tests (Charpy, Mesnager or Izod) must be considered by the steel foundries as the best way to test the quality of the steel, because mechanical working, breaking the coarse as-cast structure of the metal in forged and rolled steels. is replaced by an appropriate homogenizing heat-treatment which must be controlled. In that respect, the Charpy, Mesnager or Izod tests are the best way to investigate the toughness of the metal which is direct relation to the fine grain-size of the steel. The notched-bar shock tests at −20, −40, or −80 deg. C. are used for steel castings; they are *quality* tests which must not be underestimated.

(*To be continued*)

Aluminium Costs More

The Ministry of Materials has announced an increase in the price of virgin aluminium in ingot form from £154 to £157 per long ton, delivered consumers' works.* The new price took effect on July 1. The announcement issued by the Ministry said that the change in price was due to the further appreciation of the Canadian dollar.

For metal in notch-bar form there is an addition of £2 10s. a ton as previously. The new price applies to metal of a purity of 99 per cent. to 99.5 per cent. The premiums to be paid for higher purity ingot are increased to the following:—Minimum 99.6 per cent. purity, £2 10s.; minimum 99.7 per cent., £4 4s.; minimum 99.8 per cent., £8 8s.

Germany Seeks Steel Capacity Increase

The German steel industry is seeking permission to increase capacity to 16,500,000 tons by 1953. Eight expansion projects have been submitted to the Organization for European Economic Co-operation and the Allied Military Security Board for their approval. The next meeting of the O.E.E.C. Steel Committee is scheduled for July 10. Its recommendations are invariably accepted by member countries, although they are not legally binding. Actual authority to proceed with the projects can only come from the Military Security Board, which last year rejected some of the industry's proposals.

A SCRAP METAL DRIVE organized by the Shropshire National Farmers' Union produced over 2,000 tons of metal.

* See also page 58.

Correspondence

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

REGIONAL CONTROL LABORATORIES

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—The letters from Mr. Wizard and Mr. Mochrie in your issue of June 26 raise a matter of considerable interest. The proposal to set up regional laboratories is by no means new to the British Cast Iron Research Association. It was referred to in some detail at the annual general meeting in November, 1949, by the then president, Mr. P. H. Wilson, together with the reasons for it, fully reported in the FOUNDRY TRADE JOURNAL of November 17, 1949, and in the B.C.I.R.A. *Bulletin* for November, 1949. Furthermore, one such regional laboratory, the Scottish laboratory, has been operated by the Association, first at Falkirk and now at Glasgow, for many years, and there is a striking similarity between the work of this laboratory and that of the Ardennes laboratory of the *Centre Technique*, to which Mr. Wizard refers. The B.C.I.R.A. Council has not discussed the regional laboratory proposal, nor, of course, is it committed to any scheme, but the views of the industry would be an important factor in any future decision. Briefly, the obstacles are wholly financial and if funds were available, other problems could be surmounted.

The main object of this letter, however, is to prevent a possible misconception arising. Regional laboratories as described by Mr. Wizard and illustrated by the Ardennes laboratory are intended to provide routine control tests—chemical, mechanical, microscopic—required rapidly on production material. Mr. Wizard would probably agree that in fairness to firms who have their own laboratories (which he admits are expensive) or who use outside laboratory services, such tests should be paid for at market rates, since they are a proper charge on production. This is the practice of our Scottish laboratory. At headquarters, the laboratories are organized to deal, in the main, with the experimental research programme and development matters, and there is no considerable load of straightforward routine tests on current production material.

Such tests have to be carefully distinguished from problems and inquiries received from the industry and welcomed by the Association, both at headquarters and at the Scottish laboratory, relating, for example, to raw materials, melting practice, moulding practice, finishing processes, etc. In such cases, specific tests are not called for, but the Association uses its discretion in making appropriate tests on samples provided, and no charge is made for the report. In many cases, further information has to be called for or a staff visit arranged, and the complete report may well take two or three weeks. The inquiries from Mr. Wizard have in general been of this kind, but routine tests are reported quickly.

Since the London branch of the I.B.F. saw the Ardennes laboratory last year and has recently visited in Paris the parent organization, the *Centre Technique*, which is the French opposite number to the B.C.I.R.A., it may not be out of place to recall in this connection that the *Centre Technique* now has some nine regional laboratories in France and that it has an annual income, based on a 0.4 per cent. levy on turnover, of three to four times the highest annual income the B.C.I.R.A. has ever received, for an industry approximately half the size. It has a staff nearly three times that of the B.C.I.R.A. It can also make elaborate provision for necessary capital expenditure, as the visitors have seen at Sèvres. Even allowing for the fact that the *Centre*

(*Continued at foot of column* 2)

Technique covers all the cast metals, ferrous and non-ferrous, such an income allows the provision of much greater services, and all this has been accomplished since the last war. It is probable that the total annual funds available in France in this way for research and development on all the cast metals is more than double the total available in this country. Bearing in mind the respective outputs, the French provision is roughly four times as great.—Yours, etc.,

J. E. HURST,
President.
JOHN J. SHEEHAN,
Chairman of Council.
British Cast Iron Research Association.
July 2, 1952.

New Catalogues

Electro-magnetic Flaw-detection Ink. From the Manchester Oil Refinery Limited, Twining Road, Trafford Park, Manchester, 17, we have received an eight-page catalogue which details the application of "Supramor" brand of flaw-detection ink. There are thirteen types to choose from, giving a range of colours. It is available to our readers on writing to Trafford Park.

Zirconium Silicon Briquettes. We regret that in reviewing a four-page leaflet received from the British Electro Metallurgical Company, Limited, Grange Hall Lane, Wincobank, Sheffield, in our issue of June 5, that what must have been either an attack of myopia or a mental aberration caused us to miss out the all-important word "zirconium." This newly-developed briquette is added to the cupola charge to bestow enhanced properties on the resultant metal. The effect on the microstructure is well illustrated by four micrographs. The leaflet is available to our readers on writing to Wincobank.

Laboratory Specialities. A catalogue received from Griffin & Tatlock, Limited, Kemble Street, Kingsway, London, W.C.2, differs in many respects from those issued for the works buyer's office. It is destined to find its way into the laboratory office to be consulted over a long period, where the rather overcrowded pages will not be criticised, and the mass of technical data included will be appreciated. As the catalogue runs to 64 pages, it is, as it merits, well indexed. Such a catalogue cannot fail to interest those of our readers engaged in foundry laboratories, and it is suggested that they should write to Kemble Street for the favour of a personal copy.

Crane Speed Controllers.—A four-page leaflet received from J. H. Carruthers & Company, Limited, of Abford House, Wilton Road, Victoria, London, S.W.1, and Glasgow, S.2, first discusses the various systems that have been tried for creating creeping speeds for foundry and machine-shop cranes. It then puts forward as a solution the "MICROsen" micro-sensitive A.C. crane control. This consists of a stationary D.C. field system supplied from a single-phase rectifier and a form a squirrel-cage rotor. The leaflet carries a graph which details the speed characteristics as each notch of the control is engaged. The subject discussed is of major interest to many of our readers for "snatch" is still being experienced. This leaflet is available to our readers on writing to Abford House and as creep lifting is so important they should avail themselves of any information on this subject.

Paris Foundries Visited

Last week, when the delegation of over 40 members of the London branch of the Institute of British Foundrymen were in Paris, three foundries were visited in that area, all arrangements being made through the *Association Technique de Fonderie*. The first excursion, on the Friday morning, was to the Renault motor-car works at Billancourt sur Seine. Then, in the afternoon, the party went to the foundry of Cie Française des Bronzes Phosphoreux Montefiore at St. Denis and finally, on the Monday morning, to the Fonderies Montupet at Nanterre. There was much in each foundry to interest the visitors and each participant gleaned and exchanged information according to his particular sphere of activity within the industry. What follows is a brief summary of the chief characteristics of each of the foundries visited.

Renault Foundry

At the Renault works, the visitors were received by M. Perchat, the foundry superintendent, who personally led one of the two parties into which the team was divided. A booklet disclosed that the firm, which stood in a little hutment in 1898, now employs 40,000 at the Paris works with some 3,000 in the foundries. The foundrywork is diverse, there being cast-iron (repetition, special, and jobbing), steel, aluminium and non-ferrous sections. The British visitors were taken principally to the ferrous foundries which were large, light and airy. Some sections of these were mechanized and over 1,000 cylinder blocks are produced per shift, amongst the general run of automobile castings.

On entering the plant, our foundrymen were first impressed by the speed of production of a fairly large cylinder-block casting from moulds rammed by Sandslingers. This machine served two stations and was thus fully utilized. Four men carried out the actual moulding operations, producing 70 castings per hour, the total manning of this section being 18. Skin-drying was effected automatically in a set position as the half-moulds moved round the conveyor, the gas being cut off from the bunsen flames in between the boxes. Screw-down clamps were used for securing the moulds. The sand was naturally-bonded with extra clay addition and a small proportion of sodium silicate to resist metal penetration. Amongst the operators in this foundry, note was taken of the employment of wire-gauze face-masks, where there was a hazard of flying particles. Other interesting points observed in this section were the use of runner cups made in core-sand and incorporating a tangential inlet to the mould; a handwheel-operated sideways-moving stripping-plate for piston moulds, and the elaborate jig assembly of cores.

Cupolas and Coreshop

The cupolas serving the mechanized section, mainly for cylinder-blocks, -heads and the like, were of 9 tons per hour capacity, 44 in. inside dia. Their continuous operation for 10-hr. blows daily was helped by external water-cooling of the lower part of the shell. The cooling water was subsequently used for slag quenching, the slag being ejected from the furnace on to a weir over which water was continuously running. Intermittent tapping was practised. The charge weight was 700 kg. (14 cwt.) and coke amounted to 11 per cent. over-all. An interesting detail was a mechanical gadget for closing the tap-hole instead of the usual hand-operated bott-stick.

As in British automobile foundries, much of the shape of the final castings in these foundries was produced by cores—ratios 1:1 being quoted alike for moulding sand to core-sand and for weight of castings to weight of core-sand. Cores in one shop were produced mainly from coreblowers incorporating a turnover head. The sand, mixed on the floor above, was compounded from an excellent dried silica sand, a proprietary bond known as Linoil and a small percentage of dextrin. Only recently, had experiments been made with resin bonds. There were vertical and horizontal (push/pull) continuous core-drying ovens, and roller-conveyor transfer bogies were used extensively both for cores, moulds, and core-racks. Most interesting to the visitors was the very rapid jig assembly of complicated cylinder-block cores, frequently by using molten sodium nitrite poured into matching core holes—in this country, lead is frequently used for this purpose.

In one foundry, up to 300 moulds per hour were being produced from two machines. The machines were mainly to the firm's own designs, but the high output was not so much due to design *per se*, but to the manner of operating, whereby each machine/minute was utilized to give utmost production. In this case, it was secured by having two men moulding on each of these jolt-squeeze machines, the second man making another half-mould while the first moulder carried his half-mould to the conveyor.

Jobbing and Ancillary Sections

The Renault concern also operates a large jobbing foundry, where machine-tool castings and other heavy pieces are produced. Here, tractor-type Sandslingers were being employed for the mainly dry-sand moulds. A significant feature here was the apron-type sand seal at sides, front and rear of the large mould-drying stoves, so that the stove-bogie was not affected by the heat. In one section of this foundry a long launder connected two cupola spouts to a continuous pig-casting machine: here refined pig-irons are produced from hematite and indigenous scrap.

In the special iron foundry, steel and malleable foundries, interest centred mainly on the melting equipment—four Tropenas converters, seven electric furnaces and several pulverized fuel-fired reverberatory furnaces. The rapid moulding of individual piston rings at 25 secs. for two cake

Paris Foundries Visited

moulds, subsequently cast in stacks of 25 cakes, was observed, as was a worthwhile exhaust hood over the electric furnace doors. Other items specially noteworthy in these foundries were the provision of a separate building for sand preparation known as the *sablerie;* the use of individual bag filters for collecting the dust from grinders; a pendulum-type Wheelabrator plant for cast crankshafts, and camshafts as well as a continuous annealing plant for the same items. A worthwhile safety feature for the operatives was the employment of what appeared to be a replaceable steel toe-cap fitted externally to their boots, while at the cupola tap-hole a large gauze shield protected the cupola man from sparks.

MONTEFIORE

The visit to the phosphor-bronze foundry of Montefiore provided a most interesting afternoon, complementary to the morning visits to the ferrous foundries at Renault. This was a jobbing bronze foundry, established in 1882, comprising one large shop mainly on phosphor-bronze castings and a second on aluminium bronze. Unusual to the British founders was the fact that in France it appears that the firm's ingots are compounded on the premises, mainly from virgin materials. By contrast, in this country, the ingot manufacture for non-ferrous founders is well looked after by specialist firms. The melting plants, chiefly coke- or oil-fired lip-axis tilter furnaces of about 300 to 400 lb. capacity, were arranged mainly on one side of the shops, while moulding, core-making, closing and pouring occupied the remainder. Much of the production was of cored and solid stick and bearing bush castings for the motor-car, railway, and engineering industries and, in a less degree, for chemical manufacturing. About 100 are employed. There were two new moulding machines and two old ones in one shop, the former being Osborn jolt-squeezers and the latter of the Tabor type. The shops were well served by heavy-duty overhead cranes, the maximum casting size catered for being about 2 tons.

On a first floor above one of the shops was the *sablerie,* comprising an old shaft-driven batch-type plant and, by its side, a new Baillot semi- automatic installation as yet incomplete. Also on this floor were the spare crucibles of which two types are stocked, Morgan's plumbago and Armand, of the silicon-carbide variety. A life of 80 to 100 heats per crucible was being obtained, with up to 500 for a furnace lining.

The second major section of the foundry was engaged on a wide variety of aluminium-bronze castings, some of very large size for this alloy and some containing nickel also. A notable casting inspected was a one-ton frame for an automatic welding machine. This was cast at an angle of about 15 deg. to the horizontal and run from the top end, utilizing exothermic feeding powder to obviate secondary shrinkage. Thinner castings in this alloy are poured at an even greater slope. About 30 per cent. was quoted as a normal riser discard for this class of work, which includes a range of sea-water and other corrosion-resisting alloys.

FONDERIES MONTUPET

The third of the works visits, to the aluminium die-casting foundries of Montupet at Nanterre occupied the whole of the Monday morning. Here the visitors first entered a largish shop where about a dozen bale-out holding furnaces containing molten aluminium were serving gravity die-casting machines adjacent. Towards one end of the shop was a window-frame die-casting machine operated by compressed air for opening the die, which measured about 5 ft. square. The die was maintained at about 400 deg. C. by gas burners and four "spoonfuls" of Alpax alloy were used for pouring; production being at the rate of about one casting every 3 or 4 minutes. Before despatch to the customer, the castings were hand straightened. Inserts were cast-in for the hinge pins and fasteners.

A second most interesting job was the production of aluminium cylinder-head castings for the Simca car. For this, two main sand cores were utilized in a four-piece die. The first sand core formed the water-jacket portion and the second the upper surface of the casting; this latter also embodied the running and feeding arrangements. An output of 200 castings per day from two machines (two men to each) was being reached on this machine, which employed an oil-operated hydraulic system. Again, the die was heated to about 400 deg. C. and the metal poured at 725 deg. C. Much of the production in this foundry was of castings in an alloy similar to our D.T.D.424 which, as usual, was compounded on the premises. Adjacent to the cylinder-head station were cabinets where automatic hammer mechanisms were employed for knocking-out the cores.

In the coreshop, excellent pure-white sand from Fontainebleau compounded with 2 per cent. Linoil, 0.5 per cent. dextrin and 0.1 per cent. kerosene oil was being used on the coreblowers. For core-sands requiring higher green-strength, a silica sand having a modicum of clay (up to 1 per cent.) was used. Cores were being dried in a continuous oven arranged to consist of vertical portions for loading and unloading and a horizontal body overhead. Two hours at an ovèn temperature of 240 deg. C. was stated to be the drying cycle. A filler paste for cores, composed of plumbago and sodium silicate, was in use.

Towards the top of the shop was the battery of primary melting furnaces, comprising several rotary plants, for melting the alloy ingots for subsequent transfer when molten to the bale-out holding furnaces.

Separate sections of the works housed ingot manufacture and a refinery for the treatment of metal residues (drying, magnetic separation, etc.) prior to

(*Continued on page* 42, *col.* 2)

British Cast Iron Research Association

Open Days at the Alvechurch Headquarters

Last week, the British Cast Iron Research Association in its headquarters at Alvechurch, near Birmingham, organized two Open Days. The first was for members and such was the response that accommodation was strained. The second was for members of the Press, large users of cast iron and co-operating organizations.

Much worthwhile extension and re-equipment is in progress. Of this, the new chemical laboratory is in an advanced state of completion, but not yet equipped. The new spectrographic laboratory now contains the Quantometer, but the remaining apparatus has still to be transferred from the other section. The sands laboratory has moved from the old building into new quarters and the operational research team and development department have been given additional accommodation. This has allowed the "foundry atmospheres" team to take over part of the building opened in 1950. The heavy stores for pig-iron, scrap, sands and refractories envisaged in 1950 have since been completed and the foundations of a new experimental melting shop are now being laid. It will be clear that the general trend of these changes is to remove laboratory and experimental work from the original building, which comprised Bordesley Hall, into premises external to the Hall so that the entire group of old and new buildings is sufficiently compact for purposes of administration, the Hall itself being reserved for offices, the intelligence department and the library. In order to complete this scheme, another laboratory building will be required to house the metallurgical and chemical research.

Research Department

Research investigations fall into two classes: long-term fundamental research, and short-term research directed to the more immediate solution of specific or individual problems in the iron-foundry industry. In general, investigations in the first category are submitted to and reviewed by the fundamental research committee, while work of the second category is reviewed by the industrial research committee, and its sub-committees, which cover every branch of the industry. The research board, which forms the nucleus of each of these two committees, is broadly responsible for the general research policy of the Association.

A brief outline of the current research programme is as follows:—

(1) *Graphite formation.*—To study factors influencing the production of nodular graphite in the as-cast condition with special reference to interfering elements.

(2) *Gases in cast iron.*—To investigate the effect of gases on the properties of cast iron.

(3) *Spectrographic analysis.*—To investigate methods for the spectrochemical analysis of ores, slags, and other non-metallic materials used in the ironfounding industry. To study the application of direct-reading methods for the analysis of cast iron.

(4) *Chemical analytical methods.*—To investigate methods for the determination of trace elements in cast iron.

(5) *Enamelling.*—To study those factors in iron castings leading to enamelling defects.

(6) *Moulding sands.*—To study the influence of synthetic resins in core-making; to study factors influencing the properties of sand at high temperatures, with special reference to scabbing defects.

(7) *Fatigue.*—To investigate the influence of notching, understressing and over-stressing on the fatigue properties of various cast irons.

(8) *Impact.*—To study the factors influencing shock resistance, the nature of impact failure, and to develop impact testing methods for cast iron.

(9) *Soundness of castings.*—To study factors influencing the soundness of iron castings.

(10) *Corrosion.*—To study factors influencing corrosion and erosion of cast-iron ship propellers in conjunction with the British Shipbuilding Research Association. To study the corrosion and protection of buried cast-iron pipes.

(11) *Chilling.*—To study factors influencing chill depth and type of mottle.

Fundamental Work

Not generally realized is the complexity of the fundamental research work being undertaken by the Association. Much of it needs improvized apparatus and the application of physical and mathematical theory to empirical formulæ derived from practice. Apart from the now universally recognized work on the graphite structure of cast iron, and in particular nodular irons, such work seldom makes headlines. In fact, for one productive result probably dozens of "dead-ends" are explored. The emphasis on original work is the main difference between the Association and its Continental counterparts. For instance, the stress/strain characteristics of moulding sands at room and elevated temperatures are being studied with the object of assessing the susceptibility of different sands to produce scabbing and similar defects.

Operational Research

The inauguration of an operational research team in June, 1950, with the object of advising member-firms on means of increasing production efficiency was a new departure for the Association. The success of the experiment has been shown in the response made by the ironfounding industry. In the two years during which the team has been operating it has made 213 visits to foundries at the request

of their managements, and evidence has been forthcoming that these visits have contributed to improvements in quality, output and the correct distribution of manpower.

Teams consisting of two or three members out of the five men now engaged visit foundries of member-firms by invitation to make a general survey and to submit a confidential report to the management. The report suggests a long-term policy of planning which can be carried out over a number of years, with a view to increasing production efficiency, with reference to quality, output, cost and the economical use of manpower.

Foundry Atmospheres

Recent investigations of the conditions under which stand grinders are operated in fettling shops have shown that the conventional system of hood extraction is entirely inadequate to deal with the very fine particles of dust borne in the air stream at the periphery of the wheel. This problem has been tackled at the Association, and in particular by Mr. W. H. White of the staff, and has led to the development of a dust-extraction plant based on gravity separation for the large particles and, for the fine dust, a system involving the use of high-velocity extraction air streams above and at the side of the wheel.

Films have been taken of the production and distribution of dust by a stand grinder, with and without the improvements mentioned. A study of air movement in foundries has also been undertaken in conjunction with the Building Research Station, and other activities have included an attempt to establish a critical moisture content at which it is possible to control dustiness in sand, heat-loss from sand on belt conveyors, etc.

New Spectrographic Laboratory

The temperature of the new spectrographic laboratory, which contains the Quantometer, is controlled to within ± 2 deg. F. and attempts have been made to reduce the incidence of dust. The Quantometer comprises: (1) A high precision source unit which can reproduce almost any known type of electrical discharge; (2) a spectrometer which measures spectra by means of photoelectric cells; and (3) a recording console which records through an electronic system the photocell currents produced in the spectrometer.

Although the instrument forms a complex electronic and photo-electric system, it will be comparatively simple to operate and it is anticipated that the ordinary elements in a cast iron usually determined spectrographically will be recorded within sixty seconds of the sparking of the sample. It will be the only instrument of its kind in the ironfounding industry, although there are three or four others in the country which will be available mainly to the non-ferrous industry. While the above figures of analysis refer to elements in ordinary cast iron which can normally be determined spectrographically, some twelve elements can be dealt with in all and it is hoped to be able to carry out determinations of carbon and phosphorus, elements which are not normally capable of being determined by spectrographic means.

Taken altogether, it is doubtful if anywhere in the world there now exists superior research equipment or staff solely for ironfoundry work than that at the Association. Besides this, aspects of liaison with practical foundrymen and their difficulties and problems is as well maintained as funds allow, and this section is being extended. The intelligence department, which looks after written material emanating from the Association, maintains contact with thousands of ironfounders. Besides holding a unique library at their disposal, it issues periodical and special reports to all members as well as making available on request translations from foreign research work, an abstracting service, patent-specifications file and the like.

Paris Foundries Visited

(*Continued from page* 40)

ingot manufacture. The former plant included two sloping rotary-hearth, oil-fired furnaces of 1½ tons capacity for refining. Apparently it is the custom at this foundry to vary the amount of scrap and ingot in the charge make-up according to the ultimate purpose of the casting, so that overall percentages could not be quoted. However, as low as 6 per cent., for the total discard was considered by the visitors to be most praiseworthy. Some castings were also being produced in magnesium alloys. The heat-treatment plant, which was housed separately from the foundry, comprised two bell-type electric resistance furnaces of 50 k.w. loading and employing forced air circulation. From cold, these furnaces operated on a 3-hr. heating-up period (only 1 hr. was required when the furnace was hot), followed by a 3- to 4-hr. soak before quenching.

The British foundrymen also viewed the foundry control room and laboratory, the latter housing a Hilger spectrometer for routine analysis, as well as a plant for resin impregnation of castings (about 10 per cent. of important jobs are so treated), and an X-ray department where prototype castings and sometimes samples from batch production are examined. The equipment in this last department was a 150,000 k.w. Philips set and adjacent was a fine processing room for films. In the test-house, in addition to the more usual equipment, there was a micro-testing machine by Chévenard for trepanned-tensile test-pieces of 1.5 mm. dia. This method was employed for the routine checking of important aeroplane castings.

About 200 are employed at these works and the output averages about 70 tons of light-alloy castings per month. A 45-hr. (five-day) week is being worked and there is available a subsidized canteen for the workmen.

Brassfoundry Productivity Conference

(*Continued from page* 26)

French Efforts

Then Mr. Laws came to speak of the system instituted in France for the training of workers. Nine foundries were chosen for a start, and one man was selected from each to undergo the basic training, the man who was considered to be the most influential among the workers. The basic training was augmented by instruction in the art of expressing themselves, the art of leading discussion, teaching new operations, and maintaining good human relations. They had also the idea of appointing a representative of the employer and a workman, so that the man who had the initial training and was known as the "animator" would have support from above and below his own level.

Mr. Laws described the programme in detail, indicating the widening of its scope as it developed to cover not only plant organization, but also the reasons for and the benefits to be derived from increased productivity, the evaluation of productivity, and so on. The services of six American foundrymen were also obtained, to assist in the plants on the technical side.

A similar programme was being started in 100 foundries, and it was hoped that it would also be carried into other industries.

The 10 or 12 European and U.K. teams representing the foundry industry which had visited America, and the three or four teams from America to Europe, had produced very fine reports, of which he could not speak too highly. He believed that reports had been made since, giving information on cases in which some of the recommendations had been implemented and had resulted in increased productivity. It was very important that such information should be forthcoming in all cases. He had suggested that there should be a conference attended by delegates from the 10 or 12 teams; but he urged that all of those teams should write short reports of what had been accomplished in their sections of the industry as the result of the American visits. America and European countries had spent a lot of money on the teams, and he felt it was time they should find out what had been accomplished.

He believed the chapter on aluminium matchplates, in the brassfoundry team's report, had led to tangible results in the industry.

Early Work

DR. W. E. BERRY (Assistant Secretary, Ministry of Supply), who first conveyed the apologies of Mr. Low, the Parliamentary Secretary to the Ministry, said that Mr. Low was very enthusiastic about the conference and was very disappointed that he was not able to attend.

It would be appropriate on such an occasion, he said, to pay tribute to the Anglo-American Council on Productivity for having opened up to us the means of examining the great manufacturing industries of the United States, and their methods. The Council was formed by the joint efforts of Sir Stafford Cripps and Mr. Paul Hoffman, to whose enterprize we owed the benefits which had resulted from the Council's work. We should also remember the generosity of the United States Government in providing opportunities for the Council's activities in the States, and not least to the very many United States firms who had opened their doors to the teams and had welcomed them.

Dr. Berry was informed by the chairman that the Council had sent no fewer than 66 teams to the United States; and it had published almost as many reports. Certain general features emerged from those reports, and formed the background for the increased productivity which, everybody agreed, existed in the U.S. as compared with the U.K. They were very largely the bigger domestic market in the States, the relative abundance of raw materials, finance and power and, perhaps more than anything else, the willingness of the Americans always to adopt the latest things; they seemed to be far less conservative and far less self-conscious than ourselves. There was also more simplification, greater specialization in the use of labour, and more mechanization, particularly in the field of handling materials, because the Americans were quite convinced that they should never use their hands when, by using their heads, they could adapt processes to mechanization and save labour. There was also the planning to avoid unnecessary movement of materials, and a higher degree of planning of work throughout the plants. Finally, there was a much greater willingness on the part of American firms to welcome strangers, who might very well be their competitors, into their works.

Progress

The philosophy that, if two men each had an idea and they exchanged, they would each have two ideas, was a much better basis for progress than the rather hidebound attitude that had become traditional in some parts of British industry. It would be an exaggeration, of course, to say that the British had always been narrow-minded in regard to the exchange of "know how" and technique; there was co-operation through research associations, trade journals and other media. Nevertheless, he was sure that the visits of the productivity teams to America had resulted in a change in this country, a better approach to the philosophy of the open door and the much freer exchange of ideas.

We should not imagine, however, that America was the sole source of ideas on productivity; a great deal of work had been and was being done in this

country. Moreover, there had been developing recently in Europe an increasing co-operation on technical matters, supported by the Organization for European Economic Co-operation, whose council had recently set up a Productivity and Applied Research Committee, which proposed to study co-ordination of research and development in technical fields, the exchange of information on the technique of management and all factors bearing on standardization and productivity. The O.E.E.C. had also recommended the member countries to introduce the subject of productivity into their school curricula.

Speaking of the great importance which the Government attached to increased productivity, so that the country could pay its way, Dr. Berry said that a college of technology, with university status, was being set up to increase the supply of technologically qualified people and to ensure that the products of British brains and inventive genius were exploited by Britain instead of by other countries, as had happened much too often in the past. But that in itself was not enough. There must be drive and enthusiasm in industry to match the inspiration and genius of the scientists and technicians; and he gathered that one of the most important purposes of the conference was to determine how that enthusiasm and driving force could be created, encouraged, and harnessed for the good of the foundry industry and the country in general.

One of the conclusions stated in the brassfoundry team's report was that the Government should endeavour to restore anew the spirit of adventure, to promote a real team spirit and provide tangible incentives to produce more; and he was sure the Government subscribed to that sentiment. He emphasized, however, the difficulties in respect of balance of payments and the necessary restrictions on capital development work and the shortage of materials, which meant that it was possible to promote only very few of the numerous schemes of improvement which industry would like to undertake. But it was doing its best to provide facilities for expansion and improvement to those firms most closely connected with the drive for increased exports. But there were also many ways in which the firms themselves could improve output, apart from the assistance the Government might provide.

Materials Supplies

Coming to the question of supplies of metals, he said the position was getting easier. There was more lead now than anybody wanted, and zinc was going the same way. Only that day the Government had issued the revised statutory Order which took price control off secondary zinc, zinc scrap, and also commercial and Admiralty gunmetal. He believed it would be some little time yet before price control was taken off brass and copper; the copper supply situation was improving gradually, and he hoped that by the end of this year we should be in a much better position as regards copper supplies. However, even when those controls were removed, there was still need for industry to co-operate with the Government in the attempt to restore the balance of payments position, by economising in the use of such metals as copper and zinc, which marginally cost us dollars, by utilizing the maximum of scrap.

The recommendation in the report that the workers should decide whether they wanted leisure and security or a better standard of living was a little puzzling; if he were asked which he wanted, he would say that he wanted all three. The matter was perhaps over-simplified; the workers' attitude to productivity was much more complex than the simple choice between those things would indicate. He agreed with Mr. Laws concerning the need for education in that matter, for unless there were full explanation to the workmen they could see no further than redundancy and unemployment; the need for propaganda and education on increased productivity was very urgent indeed, for he believed it was still not thoroughly realized how urgent it was to increase our exports. He was convinced that psychological factors were of vital importance in the task that lay before us; we neglected them at our peril.

Finally, on behalf of Mr. Low, he hoped the conference would be a resounding success, and would produce results of lasting benefit to the foundry industry and to the community in general.

Steelfounders' Organization

MR. F. A. MARTIN, O.B.E., B.Sc., A.R.I.C. (leader of the British Steel Founders' Productivity Team), said it was now more than three years since that first productivity team returned from the U.S.A., after having been the guinea pigs for an entirely new experiment in international industrial relations. Because it was a new operation, some observers had drawn unjustifiable conclusions from the phenomena before them. Little credit had been given to the industry for the advances which were already under way even in the difficult years immediately after the war. Too many people had spent too much time seeking stories of improvements, estimates of benefits received and, crowning foolishness, measurements of productivity, before the report and after, as if productivity reports were something to rub on the outer skin of industry, like a cure for baldness.

The steelfounders had never admitted that their improvements in techniques of production and pro-productivity since 1949 had been solely due to the work of their productivity team. Only an industry already keenly devoted to improving its performance would have grasped so eagerly and so early its opportunity to learn from the productivity team experiment.

Before speaking of what the steelfounding industry had done about the productivity report, Mr. Martin talked of what was being done in the industry to improve productive efficiency, without claiming credit to the productivity team, nor disclaiming it. He discussed briefly the organization of the British Steel Founders' Association, showing that it was firmly established with internal and external public relations services, statistical records, and standing committees, and

more recently had set off with a swing a Research and Development Division which is expected shortly to reach adult status as a recognized research association.

The organization of the Division being a little unusual, he discussed its general set-up, in order that it might stimulate ideas. At the top level there is a research council, directing policy, and there are research committees and specialist panels operating within the industry. Four research committees are now functioning, dealing with foundry practice; plant engineering; metallurgy and quality; and steelmaking and heat-treatment.

The committee members are advisers to the research organization. They do not themselves take part in the mechanisms of research operations, either on small scale or full factory operation; it has been deemed unwise to expect men who have a full-time production job to look after, to carry out any research scheme. Moreover, all research workers must be held directly responsible to the Director of Research. Thus, if work on full factory scale is to be carried out at a member's foundry, research workers from the division's staff will be there to do it.

The specialist panels now in being cover the mechanism of freezing; physical properties; non-destructive testing and physical and mechanical testing. The universities are brought into the scheme by accepting specific projects of research to be carried out by post-graduate workers under the supervision of the professor in charge. The problem of getting the results into the shops is being given special attention by the division, which intends to take its development of processes to the stage when in an experimental unit, working on an industrial scale, it can show its findings actually at work.

Helping Simplification

Coming to contributions which can be made to higher productivity besides those of new processes, he said a strong recommendation was made to the steelfounding team that sales methods and policies (in the broadest sense) should be devoted to improving productivity. Following a conference held by the B.S.F.A. to report progress, about a year after the team's report was issued, the Association had since called for reviews from the different regions. These showed a distinct trend towards specialization of output, either arising from or leading to greater use of mechanized methods of moulding, and more efficient handling of moulds and other materials. Undoubtedly there was now a larger acreage of steelfoundry floors under gravity roller conveyors than at any previous time, and a great deal more attention was being given to handling of materials in process.

Mr. Martin offered a "ray of hope" in regard to standardization, together with a simple prescription for making the fellow who wanted a non-standard article pay for it at a rate which put a high price on fussiness. The commercial subdivisions of the B.S.F.A., he said, facilitated individual co-operative study of the requirements of sections of the market. An enlightened policy had been adopted towards standardizing large sections of the market's requirements, and though the mills of (say) a nationalized concern ground with divine tardiness, buyers responded with alacrity to offers of good deliveries and lower prices for standard designs, in preference to slow deliveries and higher prices for fancy variants. He believed that trend inevitable and desirable if we were to compete in world markets. That was an example of Association policy of which full advantage could be obtained only by individual initiative in constituent companies.

Coming to the hub of the problem, as to whether it was really to everyone's interest to obtain higher productivity, he said that in the steelfounders' report the alternative was given as "starvation," and he saw no reason to change that view. Higher productivity must be attained, and the sooner the less painful. Nevertheless, the B.S.F.A. recognized that it was of no use preaching economics to men unless they could see some practical effect. If higher productivity were a cure for our declining standards, then let its achievement be immediately apparent in an improved standard—in other words, link higher production per man to a higher earning per man.

On the matter of incentives, he asked whether the bigger wage packet was by itself a sufficient sustainer of enthusiasm and interest in getting that little bit more out of the plant, or saving that odd 2 per cent. of metal, or avoiding that 1 per cent. wastage. And he invited all to join in the search for the answer. In his view, understanding was most likely to be reached by having things right at the shop level. There it was simpler to see that a good casting, efficiently made, sound and saleable, was a source of satisfaction to moulder, dresser, foreman, and manager alike. To infect the people who worked under his control with his own desire to see two castings grow where one grew before, to gain their trust in his fairness in his dealings with them—in short, to render leadership of a high order—was the greatest contribution any supervisor could make towards improving efficiency. The study of man remained an outstanding challenge to mankind, and the ultimate problem in our pursuit of higher productivity.

Progress in Ironfounding

MR. N. P. NEWMAN, J.P. (president, Council of Ironfoundry Associations), who spoke on what the grey-iron founders had done in regard to their productivity report, said their team was in America from January to March, 1950, and their report had had a circulation of well over 12,000 copies. There was also published an abridged edition of the report, drawing special attention to those matters which it was thought should interest, and to be appreciated by, the workpeople; more than 60,000 copies of that abbreviated report had been distributed at shop-floor level.

Automobile castings, bath tubs, builders' castings, and agricultural machinery, and all types of castings lending themselves to mass production—and the C.F.A. represented both malleable and grey iron—

Brassfoundry Productivity Conference

were already produced in this country with great efficiency. Output in many individual firms was comparable with that in the United States, taking into account the rather smaller demand in this country.

One of the problems facing the ironfounders, particularly perhaps in the jobbing section, was lack of standardization. Many founders produced castings for engineering requirements, some of them weighing only a few ounces and others weighing up to a ton, or more, and there was complete lack of specialization; there appeared to be far more specialization in the United States. It was felt that that was a long-term matter of education, and it was hoped in time to be able to persuade founders to specialize in light and special application castings.

When the team's report was distributed, the C.F.A. set up a standing committee—the C.F.A. Development Panel—under the chairmanship of Mr. S. H. Russell, the leader of the team. The committee's full-time job was to visit the area associations of the C.F.A. and to make contact with individual firms, constantly pummelling the importance of increased efficiency; and the committee had done a fine job. It had been instrumental in setting up cost groups in the malleable industry and West Riding of Yorkshire, where makers of castings of like types could discuss their costs and learn their lessons.

Mr. Newman also commented on the levy on the tonnage of pig-iron producer—organized by the Joint Iron Council, of which the pig-iron producers are members—yielding about £70,000 a year. That money, together with the individual internal finances, was devoted to various organizations in the industry, including the British Cast Iron Research Association. That led him to refer to the team of experts set up within the Research Association. That team was called upon by members of the C.F.A. to visit their foundries, without charge, and to inspect them and give advice on their particular problems. That was a method of helping to increase productivity and efficiency. The team was originally composed of three people, now increased to five. Between June, 1950, and December, 1951, 93 individual foundries were visited and confidential reports made; and on the latter date there were 57 foundries on the list.

Mr. H. P. Goode, foundry superintendent of the Textile Machinery Company of Reading, Pa., U.S.A., and who had been chairman of the American Foundrymen's Society, had taken part in the discussions of the grey ironfounders' team report, and had given considerable assistance. Also Mr. Prendergast had spent several months at various times visiting foundries and giving the industry the benefit of his advice. That help was much appreciated.

Mr. Newman added that the ironfounders disseminated information regionally, and he suggested that, after the Bronze and Brass Founders' conference, they should get information to the founders in the areas, so that they could discuss matters and do something about increasing productivity.

Making the point that he was a bronzefounder as well as an ironfounder, he said he was proud of the achievements of the ironfounding industry, which produced a record output last year of approximately 3,750,000 tons; and in the first quarter of this year it had touched the 4,000,000 tons per annum mark. Output per man/year had increased since 1948 by approximately 17 per cent.

Practically every team visiting America, he continued, had stressed the superior qualities of the foremen in industry there as compared with those in our own country. That might be due partly to the vocational training at schools and colleges and the very generous equipment of the universities with specialized plant.

Britain now had the advantage of the four reports recently published by productivity teams on the training of operatives, training of supervisors, education for management, and the universities and industry. His personal conviction was that until the industry was better equipped to give training of the kind given in the United States, and until management was prepared to devote more time and expense to the training of foremen, it could not hope to equal the efficiency of American works generally. Some of that was due, of course, to the fact that many well-educated boys entered industry at shop-floor level and were much better equipped to operate smoothly the highly mechanized processes than were their corresponding numbers in Britain.

There was nothing basically wrong, he concluded, with the British workman; his only real disadvantage was that of tradition, a memory of some of the bad old days. Given the right leadership and a long-term programme of education in the advantages to themselves and to the nation which could be obtained by increasing effort, they could and would achieve productive results equal to any in the world.

At the conclusion of the speeches, MR. W. R. MARSLAND, the president of the A.B.B.F., thanked the chairman and the speakers and all who were co-operating to make the conference a success.

House Organs

S. & W. Magazine, Vol. 5, No. 6. Issued by Smith & Wellstood, Limited, Bonnybridge, Scotland.

The main feature of this issue is an article by Mr. R. F. T. Paterson, the apprentice training supervisor, which details a merit rating scheme for the encouragement of the boys, reflecting as it does in the weekly pay packet. It is a scheme worth looking into by other foundries, for it has the advantage of simplicity.

Journal d'Informations Techniques des Industries de la Fonderie. No. 38, April-May, 1952. Published by the Centre Technique des Industries de la Fonderie, 12, Avenue Rachaël, Paris, 16.

This is a special issue and gives a history of the function of the "Centre Technique," its subsequent development, its equipment and the organization of its eight branch establishments. The reason for printing this account is because the official opening has just taken place. It is thoroughly well illustrated and constitutes an authoritative description of an organization of great interest to our readers.

Institute Elects New Members

The following applications for membership of the Institute of British Foundrymen were accepted for the various grades at the meeting of the Council held at the Spa Hotel, Buxton, on June 10.

FIRST LIST

As Subscribing Firm Members

C.P.C. (Southampton), Limited, ironfounders and general engineers (representative: A. E. Bailey); The Mond Nickel Company, Limited, London, W.1, nickel refiners (representative: Dr. L. B. Pfeil).

As Members

J. A. Anderson, proprietor, Southampton Bronze Foundry, Southampton; A. E. Bailey, foundry manager and director, C.P.C. (Southampton), Limited; G. L. Barber, partner, Butcher & Barber, Slough; M. A. G. Batchelor, engineering works manager, G. P. Wilson (Engineers), Limited, Southampton; E. W. Benton, A.I.M., metallurgist, Dunswart Iron & Steel Works, Limited, Benoni, South Africa; J. D. Berry, chief engineer, Sterling Metals, Limited, Coventry; M. J. Borgerhoff, managing director, S. A. Fonderies J. Marichal, Belgium; W. J. Brown, foundry foreman, Bush & Wilton, Limited, Bitton, Glos; V. C. Burrows, company director, Standard Pattern Company, London; R. M. Carson, general manager, G. M. Hay & Company, Limited, Glasgow; A. H. Cork, foundry metallurgist, Wellworthy Piston Ring Company, Limited, Ringwood; H. B. Dauncey, company director, T. H. & J. Daniels, Limited, Stroud; F. W. Evans, managing director, Hearsall Pattern & Castings Company, Limited, Coventry; N. Gray, chief metallurgist, Guest Keen & Baldwins Iron & Steel Company, Limited, Cardiff; H. Griffiths, master patternmaker, H. Griffiths, London; C. Hand, A.I.M., foundry manager, Sheepbridge Steel Castings, Limited, Sutton-in-Ashfield; E. Kent, managing director, Coleman-Wallwork Company, Limited, London; H. T. Knight, company director, Standard Pattern Company; S. Lee, foundry foreman, Barr Street Castings, Limited, Birmingham; V. W. Meager, M.Inst.B.E., director and general manager, Bardic, Limited, Southampton; L. B. Pfeil, O.B.E., F.R.S., director and manager of development and research department, Mond Nickel Company, Limited; B. W. Rogers, technical director, Aluminium Die-Castings (Birmingham), Limited; A. C. Sheldon, managing director, Eclipse Foundry & Engineering Company, Limited, Tipton, Staffs; H. W. Sims, technical officer, Starling Foundries, Limited, Croydon; B. S. J. Tyberg, chief metallurgist and laboratory manager, Huskvarna Vapenfabriks A.B., Huskvarna, Sweden; E. M. Yorath, works manager, Guest Keen & Baldwins Iron & Steel Company, Limited, Dowlais, Cardiff; H. P. Hughes,* technical consultant, British Electro Metallurgical Company, Limited, Sheffield; C. M. Joseph,* manager, steel foundry, National Iron & Steel Works, Howrah, India.

As Associate Members

A. J. Boddington, works representative, Guest, Keen & Baldwins Iron & Steel Company, Limited; G. N. Cherry, B.Sc., representative Foundry Services, Limited, Birmingham; P. A. Crooke, foundry manager, Brockworth Engineering Company, Limited, Glos; A. R. Ford, works manager, Vowles Aluminium Foundry Company, Limited, West Bromwich; C. H. Gibbs, foundry superintendent, Richardson & Cruddas, Bombay, India; S. D. Gordon, technical representative, Morgan Crucible Company, Limited, London; A. L. Harris, foundry foreman, E. H. Bentall & Company, Limited, Maldon, Essex; R. N. Homer, instructor, foundry training school, General Electric Company, Limited, Witton; A. H. W. Hopkins, coremaker, Royal Ordinance Factory, London; J. Horton, coreshop foreman, Duport Foundries, Limited, Dudley Port; A. B. Hunt, electric melting furnace superintendent, F. H. Lloyd & Company, Limited, Wednesbury; S. R. Ireland, refractories and crucible engineer, Carborundum Company, Limited, Manchester; R. J. Leonard, metallurgist, Wellworthy Piston Rings, Limited; D. Longley, engineers' patternmaker, Frank Ives Lockwood, Huddersfield; G. C. Pitt, G.I.Mech.E., lecturer, Glamorgan Technical College; M. S. Rashid, student, National Foundry College; G. R. Spence, works engineers, J. Stone & Company (Deptford), Limited; S. Tyler, foreman patternmaker, I. H. Bentall & Company, Heybridge, Essex; D. F. Bailey,* foundry technician, Sterling Metals, Limited, Coventry.

As Associates (over 21).

L. Arzewski, assistant chemist, Dartmouth Auto Castings, Limited, Smethwick; D. W. S. Hurst, plant manager (metallic abrasives department), Bradley's (Darlaston), Limited; D. H. Butler, B.Sc., development officer, Phosphor Bronze Company, Limited, Birmingham; J. Lawton, moulder, Lawton Bros., Stoke-on-Trent; R. S. Smith, laboratory assistant, British Piston Ring Company, Limited, Coventry; R. J. Wright, laboratory assistant, Dartmouth Auto Castings, Limited, Smethwick.

As Associates (under 21).

A. Campden, craft apprentice, English Electric Company, Limited, Rugby; T. T. Carter, apprentice ironfounder, Kaye & Company (Huddersfield), Limited; M. J. Cole, metallurgical apprentice, John Harper & Company, Limited, Willenhall; J. G. Emms, foundry apprentice, B.A.C., Limited, Smethwick; B. H. Evans, foundry craft student apprentice, General Electric Company; J. P. Harper, apprentice moulder, Holman Bros., Camborne, Cornwall; R. Hazzard, trainee metallurgist, John I. Thorneycroft, Limited, Southampton; W. J. Rule, apprentice moulder, Holman Bros.; J. L. Stockley, foundryman patternmaker, A. Herbert, Limited, Coventry.

SECOND LIST

As Subscribing Firm Member.

Consultus, Wilmslow, Cheshire, foundry and general engineering consultants (representative: R. Lickley).

As Members.

D. Astall, foundry owner, D. Astall & Son, Manchester; A. E. Gibson, foreman, British Railways Loco Works; R. Lickley, development engineer, Revo Electric Company, Tipton, Staffs; J. E. Storey, managing director, Storey Foundry Company, Limited, Stockport, Cheshire.

As Associate Members.

J. F. Giblin, metallurgist, British Insulated Callender's Cables, Limited, Prescot, Lancs; T. I. Jones, A.I.M., foundry metallurgist, Platt Bros. & Company, Limited, Oldham; N. Thomasson, metallurgist, Platt Bros. & Company, Limited.

As Associates (over 21).

T. I. Astall, laboratory assistant, National Gas & Oil Engine Company, Limited, Ashton-under-Lyne; T. Evans, technician, British Railways Loco. Works, Horwich; B. Trought, wood patternmaker, J. S. Doig (Grimsby), Limited; R. G. Wooster, industrial chemist, H. Incledon, Benoni, South Africa.

As Associate (under 21).

D. Fisher, assistant foundry metallurgist, Platt Bros., Limited.

* Transferred.

Parliamentary

Steel Allocation Scheme

Asked by MR. G. R. STRAUSS in what way he was proposing to vary the principles on which the steel allocation scheme was being administered. MR. SANDYS, Minister of Supply, said that no changes were proposed in the principles on which the steel allocation scheme was administered, but increased preference would be given to firms capable of expanding their exports.

MR. STRAUSS: "Does that mean that the principles being employed by the present Government are those which were employed by the late Government, in that the steel allocation is varied quite materially according to the export performance and prospects of various firms? In other words, there is no change at all."

MR. SANDYS: "As I said, there is no change in principles, but we are putting even greater emphasis on exports, particularly exports of goods which have a high conversion value in non-sterling currencies."

MR. NABARRO asked if the Minister was aware that both sides of British industry generally were very happy and satisfied with the administration of this rationing scheme, and particularly the special applications that were made to his department for consideration for more export work, while MR. EWART asked if the Minister included the shipbuilding industry in his vital exporting industries, and if so, would he note that there was a shortage of steel in that industry at present.

MR. SANDYS: "There is, of course, a shortage of steel in every industry, but I personally am responsible only for those industries for which the Ministry of Supply is the sponsoring authority."

LIEUT.-COL. LIPTON asked the Minister of Supply to what extent he controlled and co-ordinated the issue of certificates by other Government departments permitting the purchase of steel by local authorities, nationalized industries, and private firms.

MR. SANDYS: "Not at all."

COL. LIPTON then asked if the Minister was aware that there were vast quantities of chits for steel in circulation and for which there was no steel, and as it was sometimes months before the chits were honoured, did not that indicate—apart from the new priorities which he was seeking to inject into the present system of allocation—that the system of steel allocation certificates was breaking down and was on the verge of collapse.

MR. SANDYS: "I think, as Mr. Nabarro has just said, that it is working surprisingly well."

Industrial Application of Technical Developments

When MR. LEE asked the Parliamentary Secretary to the Ministry of Works, as representing the Lord President of the Council, what steps he was taking to enable the results of scientific research to be brought to the attention of those industries which could, with advantage, make use of them, MR. MOLSON said that Government departments were paying special attention to making the results of scientific research widely known to industry by means of publication in all forms and by advisory services. The research associations managed by industries also made special efforts to inform their members of the latest scientific developments.

Replying to a further question by MR. LEE, MR. MOLSON said he thought it would be true to say that in many cases the most up-to-date scientific knowledge was not being made full use of by industry. On the other hand, so far as the Government was concerned, the Ministry of Agriculture operated the National Agricultural Advisory Service; the Ministry of Fuel and Power, the Fuel Efficiency Advisory Service; the Board of Trade, the Regional Boards for Industry; the Ministry of Works had in the regions and in London technical information officers, and HM Stationery Office issued reports, abstracts, and articles. A great deal was also done in the way of lectures and publicity of various kinds.

Technical Education in Scotland

Important extensions have been completed at the Heriot-Watt College, Edinburgh, and Robert Gordon's Technical College, Aberdeen. This was stated in a written answer by MR. J. STUART, Secretary of State for Scotland, when asked by MR. M. MACPHERSON what specific arrangements he was making for the further development of technical education.

MR. STUART also said that an extension to the Dundee Technical College was due to be completed in time for next session. A very large extension of the Royal Technical College, Glasgow, was now proceeding and a further extension of the Heriot-Watt College had just commenced. Plans were now being prepared for an extension of Paisley Technical College.

Europe's Steel Output Increases

Crude steel production in Europe (not counting the Soviet Union) established a new record during the first quarter of this year, according to figures issued by the Economic Commission for Europe.

The commission estimated that during the first quarter of 1952 European crude steel production was at an annual rate of 72,892,000 metric tons. while output in the corresponding period of last year was about 67,623,000 metric tons. For purposes of comparison, United States crude steel production during the first quarter was at the annual rate of 98,692,000 metric tons, compared with 95,377,000 metric tons in the same period of 1951. No figures were available for Soviet Union production during the first three months of 1952, but it was estimated that U.S.S.R. production last year totalled 31,300,000 metric tons.

The importance of Africa as a source of raw materials for steelmaking was evident from data on overseas countries supplied in the E.C.E. report.

The following table gives details (in metric tons) of European steel output in 1951 and in the first quarter of this year.

	1951.	1st quarter, 1952 (annual rate).
REPORTING COUNTRIES:		
United Kingdom	15,889,000	16,244,000
Western Germany	13,506,000	15,236,000
France	9,832,000	10,684,000
Belgium	5,091,000	5,456,000
Italy	2,994,000	3,392,000
Luxemburg	3,077,000	3,164,000
Saar	2,603,000	2,764,000
Sweden	1,525,000	1,668,000
Austria	1,028,000	1,108,00C
Spain	812,000	832,000
Netherlands	553,000	584,000
Others	1,177,000*	1,260,000*
TOTAL	58,087,000*	62,392,000*
OTHER COUNTRIES:		
Czechoslovakia	3,312,000*	†
Poland	2,792,000	3,188,000*
Eastern Germany	1,552,000	†
Hungary	1,234,000*	†
Rumania	646,000*	†
TOTAL	9,536,000*	10,500,000*
TOTAL EUROPEAN PRODUCTION	67,623,000*	72,892,000*

* Estimated figure. † Not available.

Process Control of Cast Iron for Vitreous Enamelling*

By J. Bernstein, A.R.I.C., A.C.T. (Birm.), A.I.M.

(*Continued from page 606 of Volume 92*)

Melting and Chemical Composition of the Iron

Probably the majority of castings to be enamelled are poured from cupola-melted iron and the charges melted invariably consist predominantly of pig-iron and cast-iron scrap. The chemical composition of the raw materials melted should be known and each charge should be weighed, so as to obtain consistent melting conditions. As the chemical composition of bought scrap iron is largely an unknown factor, it is advisable to avoid melting this. Sometimes, however, bought scrap must be used and provided that no more than 10 per cent. of the total iron charged consists of bought scrap and what scrap is melted is carefully selected no trouble should be experienced. Scrap which may contain alloy additions should not be used. When the pig-iron supply position necessitates the use of a high proportion of scrap in the charges it has been found that the addition of ferro-silicon and ferro-manganese in the cupola to obtain the desired composition of the iron is not detrimental for enamelling. While the use of steel scrap is also condemned by many founders, the Author has found that, provided the proportion of steel scrap in the charges does not exceed 3 to 4 per cent., it can be melted successfully. The final composition of the iron is considered to be the prime factor rather than the make-up of the charge.

An observation recorded is that the rate of melting appears to affect the enamelling results. Fast melting appears to give the best results while slow melting tends to yield a " sluggish " iron, which may cause a large number of reject castings in the foundry in addition to the enamel-shop. The major fault in such foundry rejects is sub-surface cavities which have the appearance of gas holes. The iron should preferably be tapped very hot from the cupola and allowed to cool in a receiver or large ladle before being skimmed and transferred to the pouring ladles for casting. The chemical composition of the iron may be the same, whether the iron is tapped hot or on the cool side, but there is some difference in the properties or " nature " of the iron. This may be a function of the gas content of the iron, but whatever it is, it would appear to a field of investigation that would provide most useful information. Examination of the form of the manganese sulphide and other inclusions in the iron to determine whether the iron tapped hot could be described as oxidized compared with iron melted slowly and tapped cold has so far yielded no information.

* Paper presented to the Spring meeting of the Institute of Vitreous Enamellers at Southport. The Author, who is attached to the Simplex Electric Company, Limited, submitted this Paper as a communication from the Institute of British Foundrymen.

Chemical Composition

It would be wrong to specify the chemical composition for all cast iron which is to be enamelled, but for light castings, of the gas- and electric-cooker type, some guidance may be given. The range of chemical composition per cent. which has been found consistenly to give the best results is as follows:—

Combined Carbon	0.50—0.75
Total Carbon	3.0 —3.2
Silicon	2.8 —3.0
Manganese	0.4 —0.7
Sulphur	0.120 max.
Phosphorus	0.9 —1.1

It is emphasized that this range of composition which gives consistently good results does not mean that compositions outside this range will necessarily yield poor enamelling results; for example, irons containing 2.4 per cent. silicon, 1.4 per cent. phosphorus, and 0.18 per cent. sulphur have enamelled without difficulty. Melting conditions in a cupola fluctuate during the day and slight variations in analysis obtain in almost every tap. The carbon-equivalent value (C.E.) derived from the carbon, silicon and phosphorus contents of the iron according to the expression

$$C.E. = C + 0.3(Si + P)$$

is a useful guide for the production of sound, light iron castings but does not entirely satisfy the needs of the founder producing castings to be enamelled. It is considered that the state of the carbon in the iron is more important that its " equivalent value." The amounts of carbon and silicon in unalloyed cast iron are the elements controlling the state of the carbon and these elements therefore need to be more closely controlled than say the phosphorus or manganese contents. From the production point of view, phosphorus contents of the order of 0.9 to 1.1 per cent. may be essential to avoid an undue quantity of misrun castings. In addition, the present raw-material situation reduces the metallurgist's ability to control this element. To reduce the phosphorus content in cast iron, either low-phosphorus pig-iron or steel scrap must be used. Structures such as are shown in Figs. 1, 2, and 3 will enamel satisfactorily. Too much steel in the charge is likely to produce trouble for the enameller and a recent experience showed that even a small amount of hematite pig-iron caused many rejects in the enamel shop. (This was due to the formation of kish-type graphite in the castings.) Structures such as are illustrated in Figs. 4 and 5 may be expected to prove troublesome on enamelling.

Control of the silicon content during melting and the effect of silicon as a graphitizing element is much more significant than that of manganese.

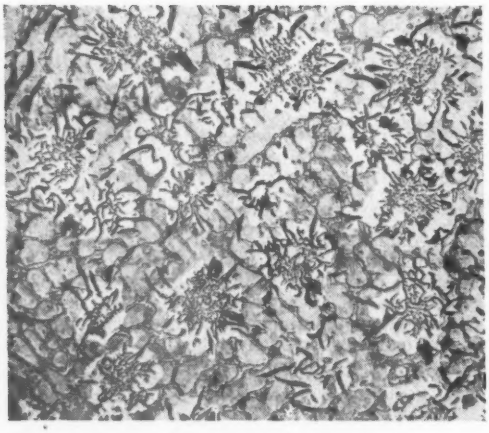

FIG. 1.—*Undercooled Graphite in Rosette Form in a Matrix of Ferrite and Pearlite. As-cast,* ×150, *etched in* 4 *per cent. picral.*

Sulphur is mainly absorbed from the coke during melting, and its carbide-stabilizing influence can easily be offset by the appropriate addition, if necessary, of manganese. While in general sulphur contents should be kept in the region of 0.10 per cent., provided that no free iron-sulphide is present in the castings, no trouble during enamelling should be anticipated from higher sulphur contents. To ensure the absence of free iron-sulphide in the iron, the manganese content should be in excess of that called for in the expression

per cent Mn = 1.7 × per cent S + 0.3

i.e. for irons containing sulphur contents between 0.12 and 0.16 per cent the manganese content should be at least 0.6 per cent. By changing the identification mark of castings made throughout the day it has been possible to study the effects of the changes in chemical composition on the enamelling results. It was found that higher carbon contents were obtained first thing in the morning and afternoon, *i.e.* in iron melted on a fresh bed of coke, and examination of the enamelling rejects showed that a greater percentage of the rejects for blistering coincided with the higher carbon contents in the castings. This difference in carbon content was only a matter of 0.15 to 0.20 per cent. As it is not easily possible in a continuous casting foundry to avoid pouring castings to be enamelled for the first half-hour in the morning and afternoon, the addition of steel to the first half-dozen or so charges will reduce the carbon content of the iron at these times. This practice is carried out regularly with good results.

The presence of strong carbide-stabilizing elements, such as chromium, in the iron is to be avoided in all cases, except where the carbon content of the iron is higher than that found to give best results in a particular type of casting.

Microstructures

The notes on chemical composition are closely related to the resulting microstructures of the castings, for it has been found that the form of the graphite and combined carbon in the castings influences the enamelling results. Massive cementite in the as-cast condition is harmful and that is probably the explanation for the almost universal objection to chromium. Coarse graphite, either as long flakes or in kish form, also is harmful. Experience indicates that for the best enamelling results the microstructures of the castings should contain medium to fine flake-graphite randomly distributed, or undercooled graphite in rosette or dendritic form occurring in a matrix of ferrite or ferrite and lamellar pearlite. An almost completely ferritic matrix often gives better results than a mixed pearlite and ferrite, or completely pearlitic matrix. This, perhaps, is why more-consistent results on enamelling are obtained from castings which are annealed.

Again it is unfortunate, or fortunate, that exceptions to the rule occur, for many castings which have contained kish-type graphite have enamelled without any trouble and some organizations prefer not to anneal the castings. The importance of even section-thickness in the castings will immediately be appreciated when discussing the microstructures of castings to be enamelled. Large bosses which cool more slowly in the mould will have a coarser structure and this fact together with the thermal considerations during fusion of the enamel will affect the ultimate result.

Cleaning of Castings

Much time and expense is saved if the foundry inspection is strict and all doubtful castings are scrapped. To ease the task of inspection, castings should be shotblasted in the foundry before dressing, sub-surface defects can then more readily be identified. Blowholes, scabbing, rat-tailing and

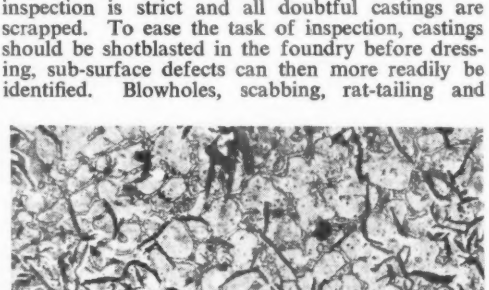

FIG. 2.—*Fine to Medium Flake Graphite in a Matrix of Ferrite and Pearlite. As-cast,* ×150, *etched in* 4 *per cent. picral.*

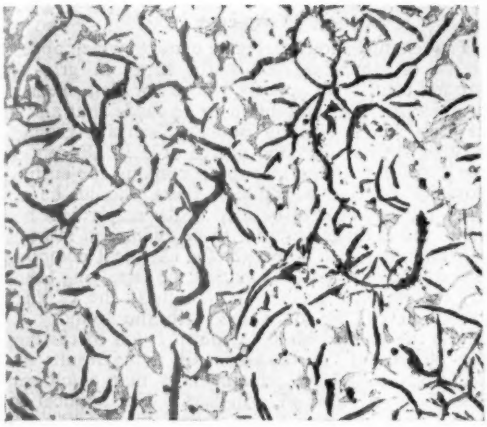

FIG. 3.—*Another position on the same specimen as illustrated in Fig. 2 showing a Change in Structure resulting from Annealing at* 810 *deg. C. for* ½ *hr. Section thickness of Casting* $\frac{3}{32}$ *in.* ×150, *etched in* 4 *per cent. picral.*

"drawing" sometimes cannot be detected in castings until they have been shotblasted. It is insufficient in flat castings, particularly hob castings, merely to visually inspect the castings. Flat surfaces should be checked with a straight edge and also felt with the fingertips. Soft ramming or movement of part of the moulds may produce a disturbance of the casting surface which may be overlooked during visual examination before enamelling. Small blowholes can successfully be plugged with cast-iron rod or welded with a cast-iron filler. If the flanges of large castings misrun, it is possible to reclaim these by "burning." This process which is often practised in jobbing foundries but not normally on light castings, consists of ramming sand around the misrun area and moulding the desired shape which is then filled with hot iron. The affected area should of course be heated first to avoid cracking.

The handling of castings during dressing, inspection and delivery to the enamel-shop should be closely watched to avoid breakages. Care should be taken during dressing to ensure that deep grinding-wheel marks are not left in the castings. These marks may not be removed by subsequent shot-blasting and may spoil the appearance of the enamelled castings.

ENAMEL-SHOP

In the enamel-shop more so than in the foundry, cleanliness and orderliness are essential and it would be wrong to assume that because good-quality castings have been delivered from the foundry, enamelling may be carried out free from trouble. The same care in treatment of the castings should be applied in the enamelling department as is taken in the foundry. Handling, dressing, cleaning and inspection are common factors, spraying can be compared with moulding, fusing with casting and the control of the composition of the enamel can be compared with the composition of the iron. Standards must be set and maintained and supervision should be even stricter than in the foundry.

As this short Paper is mainly concerned with the process control of the castings it is not intended to discuss the milling and preparation of the enamels or the relative merits of different types of grip and finish coats. The comments made apply to acid-resisting enamelling in general and not to particular methods or enamels.

Preparation of the Castings for Enamelling

The first operation applied to the castings received from the foundry will probably be the drilling and tapping of holes. This should not be done in the enamel-shop, neither should any dressing operations additional to the foundry dressing, otherwise contamination of the shop atmosphere may result. If annealing is carried out as a preliminary to enamelling, the temperature employed should always be above that attained during fusion of the enamel. It appears to be quite arbitrary whether annealing is carried out or not, for excellent results can be obtained with or without annealing. Before deciding whether this additional operation should be introduced, it would be wise to consider first what it is intended to achieve. If the annealing of light castings within the range of chemical compositions given earlier is carried out at approximately 810 deg. C. on the basis of 30 min. for each ¼-in. of section thickness, a change in the microstructure of the iron will result. The amount of free cementite and lamellar pearlite will be reduced and the general structure will most likely consist of flake graphite in a matrix of ferrite. Residual casting stresses will be removed with or without warping of the castings. Some enamellers claim that annealing removes trapped gases in the castings and removes the dirt from them. Heating a casting will certainly be accompanied by the evolution of some gaseous phase but it is expected that during cooling down to room temperature equilibrium will be restored and gas that has been expelled from say internal porosity is likely to be replaced if only by atmospheric air and moisture. On subsequent heating, i.e., during fusion of the enamel, this air will expand and be evolved. Should what the enameller classes as "dirt" be present in the castings, assuming he means entrapped slag or sand, the introduction of annealing will certainly not remove it. If, during transit through the machine-shop, the castings become contaminated with oil or grease, annealing is essential. Annealing is also recommended if the castings have been standing for a period of weeks or months prior to being required in the enamel-shop. Surface oxidation of sulphides, slight decarburization of the surface of the castings, the removal of adsorbed water-vapour and other gases and a change in the microstructure of the iron may occur during annealing. It is questionable if these possible changes at the surface are necessary, if subsequent shotblasting will in any event remove at least as much of the surface as has been most

FIG. 4.—*Kish-type Graphite in an Annealed Casting $\frac{1}{16}$ in. thick. To the Naked Eye, such Coarse Graphite may give the Appearance of Internal Porosity;* ×150, *etched in 4 per cent. picral.*

affected. Apart from the change in the microstructure, it is difficult to assess what improvements in the castings have resulted.

Warping

Where warping during annealing has occurred in castings with relatively large areas of flat surface, careful shotblasting will tend to correct the distortion. In any particular casting it may be found that distortion occurs during shotblasting according to which side of the casting is blasted first. Because warping during annealing or distortion during shotblasting occur, it is wrong to blame the castings and reject them to the foundry. It is essential for the enameller to know something of the physical properties of cast iron so that he can deal with his material accordingly. If the design of the casting is such that it is highly stressed, then warping or perhaps cracking must be expected when the castings are raised above normal stress-relieving temperatures and are submitted to violent thermal shock as is such common practice in batch-type annealing furnaces.

Immediately after annealing, the castings should be thoroughly cleaned on all sides by shotblasting and all fine dust either brushed or blown off. Inadequate cleaning of the castings is certain to cause considerable trouble to the enameller and this part of the preparation of the castings for enamelling requires the strictest supervision. The size of shot and working pressure are matters for individual choice.

Shotblasting is usually followed by casting inspection so that faulty castings may be segregated into various groups. The usual groups are (1) rejects to the foundry; (2) rejects for plugging or welding; (3) rejects for straightening or further shotblasting and (4) rejects for filling.

Grip-coat

Few enamel-shops segregate castings which appear to be of doubtful quality for firing in grip- or ground-coat. It appears more or less general practice for the assumption to be made that all the castings are sufficiently poor to warrant ground-coat or sufficiently good not to need it. Except in the case of castings known to contain sub-surface porosity or coarse graphite, there should be no need for grip-coat to be used in the majority if not all of the castings required to be enamelled in acid-resisting enamel. Whenever the chemical composition of the castings falls outside the supplying foundry's normal range, or other faults in the castings are observed, the onus lies with the foundry to advise the enamel shop so that a batch of castings can be treated " direct-on " and, if the results are not satisfactory, the remainder of that batch can then be fired first in grip-coat. The application of grip-coat appears to be treated more or less in the same light as annealing by some enamellers. It is regarded as an extra precaution to be used in obtaining good results, whereas its use should be limited if the maximum serviceability from the enamelled castings is required rather than mere appearance. Grip-coat does in general tend to reduce the incidence of " boiling " and blistering in the enamel but has the disadvantage of reducing the strength of adhesion between the casting and the enamel. The enamel is more likely to chip off under mechanical stress when grip-coat is used, but the degree of chipping depends on the type of grip-coat used. Where grip-coat is used, it should be remembered that just as it is important to anneal at a higher temperature than during fusion of the enamel it is doubly important to ensure that firing of the grip-coat is carried out at a higher temperature than firing the finishing coat. This temperature difference should be of the order of 20 deg. C.

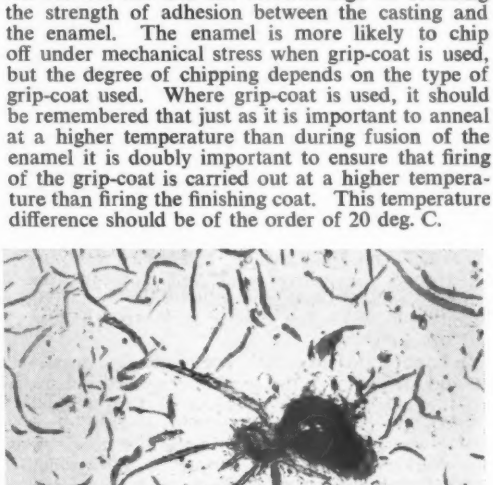

FIG. 5.—*Photomicrograph of one form of Internal Porosity. To the Naked Eye this is indistinguishable in Appearance from that of Fig.* 4. ×150, *unetched.*

Enamels

A general precaution invariably adopted is to allow the prepared enamels to stand 24 hrs. or at least overnight before spraying commences. Hydration and combination of certain of the constituent oxides is thus allowed to take place to an extent such that a further period of a few hours during which the enamel is in use is unlikely to effect any noticeable change in the state of the slop. Cleanliness is a vital factor in the mill-room and this fact should be impressed upon the operators. In the process of spraying, and in the equipment used by the sprayers, the importance of cleanliness again cannot be over-rated. After blowing-off dust from the shotblasted castings, they should be handled carefully and as little as possible before they are passed to the sprayers. Spraying should be carried out with the same care that is applied during moulding of the castings. Here again the designer of the castings can ease the task of the sprayers. Sharp corners and edges prevent uniform application of the enamel, internal corners often holding excess enamel while the external corners are often thinly sprayed. The operators should be trained to follow a fixed routine so that all surfaces of the castings receive the same number of passes and that the point of ejection of the spray is at the same distance from the area being sprayed throughout the whole operation. Automatic continuous spraying units should assist in removing some of the faults caused through the non-uniform spraying by different operators.

Drying of the sprayed castings should be carried out sufficiently slowly to ensure that all water is removed from the enamel and from the surface of the casting. Drying too rapidly may cause spitting and other disturbances in the sprayed surfaces. The atmosphere in the dryers should from time to time be tested to ensure that sufficient air is present to prevent saturation of the atmosphere with water-vapour which would thus inhibit the process of drying. During a period in which abnormally high rejects were being obtained, the source of the trouble was found to be lack of adequate air circulation in a continuous dryer.

Fusing

As soon as possible after drying, the castings should be passed to the furnaces for fusing. One of the reasons for ensuring the minimum of delay between drying and fusing is that the dry " biscuit " will absorb water-vapour from the atmosphere and this may cause severe blistering of the enamel, particularly if batch-type furnaces be used. The effect will be less harmful if firing is carried out in a continuous furnace. Many types of furnaces are in daily use, each having its particular advantages and disadvantages. In general, batch-type furnaces are more adaptable when a wide range of castings is passing through the enamel-shop, but continuous furnaces offer a wider tolerance in certain respects. Reduced thermal shock and more-uniform temperature distribution in uneven section thicknesses in castings are two points of advantage for continuous furnaces. The effect of the atmosphere of the enamel fusing furnace is a subject at present under investigation; the particularly deleterious effects of high-sulphur contents in furnace atmospheres are known, but the effects of carbon monoxide and carbon dioxide are less understood.

" Blistering " and " Boiling "

During an extensive investigation into the incidence of a considerable amount of " boiling " or blistering on castings which were known to have been made under conditions proved previously to be most satisfactory, which were within the limits of chemical composition and had the required microstructure some interesting observations were made. A few of these are recorded in what follows:—

The most outstanding observation was that the speed of processing, measured by the time interval between annealing and fusing of the finish-coat, should be as rapid as possible. This does not imply that any individual operation should be hurried but that the absolute minimum of delay should elapse between operations. If annealing is carried out, the castings should be shotblasted and prepared for spraying while still warm or as soon as room temperature is attained. The castings should then be sprayed as soon as possible, provided that they are at room temperature, as the freshly shotblasted cast iron is prone to atmospheric attack, which cannot be perceived by eye. The minimum of delay should be permitted between drying and fusing. It may be necessary completely to reorganize the system of the enamel-shop in order to obtain the minimum time-cycle and it is appreciated that a busy department may find it difficult to ensure that castings are treated in strict rotation, but the improvement in results will more than justify any inconvenience.

As a further aid to reducing the number of enamelling rejects, the treatment of castings by pickling in a bath of dilute sulphuric acid after shotblasting was tried. It was reported that the quantity of graphite at the bottom of the pickling tank was evidence of the amount of dirt removed from the castings by this process! In actual fact the improvement in results was obtained by the use of a neutralizing bath containing borax. A thin film of borax remained on the castings after swilling and it is thought that the slight fluxing action of the borax coupled with some apparent sealing of the surface of the castings was the controlling factor and not the acid dip. This was later demonstrated by dipping other castings in a dilute borax solution before spraying. A slight improvement in enamelling results was observed, but this process which was tried with some success during the troublesome spell is not generally recommended.

" Biscuit " Condition

Although it is emphasized that, as a general rule, castings should not be allowed to remain in the " biscuit " stage longer than absolutely necessary for continuous production, it has been found that in certain cases, if the biscuit is too dry on being placed in a batch-type furnace, the sudden increase

in temperature causes the biscuit to flake off. Some evidence has been obtained which appears to indicate that for certain types of biscuit a small amount of residual moisture is necessary to give it sufficient bond to withstand vibration, thermal shock and the pressure from expanding gases formed at the surface of the castings. A study was made of the moisture content of the biscuit enamel on a number of castings on removal from the dryer and after varying periods of atmospheric exposure before fusing. A most rapid absorption of moisture was noted in the first fifteen minutes after reaching room temperature under a number of different atmospheric conditions. The rate of further moisture absorption slowed down gradually and the final figure obtained varied with atmospheric conditions. It was noted that best results appeared to obtain when the moisture of the biscuit enamel immediately prior to the castings entering the furnace was of the order of 0.03 per cent. Higher moisture-contents tended to give boiling defects, while lower values often resulted in patchiness due to flaking.

While it was found that the deliberate addition of soluble carbonates to the water used in preparation of the enamel slop resulted in considerable boiling of the enamel, it was not possible to attribute the high enamelling rejects in production to the hardness of the water being used at that particular time.

Conclusion

In concluding this Paper, in which an attempt has been made to discuss some points found to influence the quality of castings in the as-cast state and enamelled state, it is emphasized that the process control of castings for vitreous enamelling does not end in the foundry. Control in the enamel-shop ranks equal in importance with control in the foundry. Cleanliness, speed of process and the maintenance of set standards are prime factors and can only be achieved by continuous supervision. Close co-operation between the foundry and enamel-shop will help to prove that the enamelling of cast iron is a practicable proposition on a large scale and that it is unnecessary to turn to steel.

New Blast Furnace Blown-in at Margam

The new No. 3 blast furnace at the Margam Works of the Steel Company of Wales, Limited, has been blown-in and has produced iron for the first time. The furnace, which has a 25 ft. 9 in. hearth diameter, is the second of its kind to be erected as part of the development project which has been carried out at the works since 1947.

The furnace stands on a site formerly occupied by a 16-ft. furnace which was completely dismantled before erection of the new furnace could begin. Work on the dismantling of the old furnace began in November, 1950, the day after the new No. 2 furnace came into operation. By February, 1951, the old furnace had been completely dismantled, after which the foundation block had to be removed and the new foundation block constructed. Erection of the steelwork for the new furnace began in July and bricking started in September, 1951. Altogether 2,000 tons of steelwork and more than 250,000 refractory bricks have been used in the erection of this furnace.

Air for the operation of the furnace is supplied from the new No. 3 turbo-blower which was given a trial run-up by the Duke of Edinburgh when he visited the Margam Works on May 8.

The new furnace is capable of producing 1,000 tons of iron a day given suitable iron ore.

Iron-ore Plant for Yugoslavia

A contract for a complete iron-ore handling plant to the value of over £1,000,000 has been confirmed between the General Electric Company, Limited, and Invest Import, of Belgrade. The plant, which is to have a capacity of 500 to 690 tons per hr., includes mechanical and electrical equipment and will be manufactured at the Fraser & Chalmers Engineering Works and the Witton Works of the G.E.C. Delivery to the Zenica Iron Works, Yugoslavia, is scheduled for two years.

This installation will form part of a complete iron-making plant, the consultants for which are Meckenzie Engineering, Limited, London.

£500,000 Order from Australia

The Brush Aboe group of Companies has received from the Australian Government an order for equipment worth more than £A500,000. The order, received through the group's Australian company, British Oil Engines (Australasia) Pty., Limited, and placed by the Australian Department of Works and Housing, is for Diesel engines and electrical equipment for defence projects.

Seventeen 12-cylinder, turbo-charged, vee-form, Diesel engines to be supplied by Mirrlees, Bickerton & Day, Limited, Stockport (Ches), are included in the order. These engines are coupled to alternators giving an output of 780 k.w., to be supplied by the Brush Electrical Engineering Company, Limited, Loughborough (Leics), together with switchgear and other accessories. The equipment will be installed by the group's own engineers.

Steelworks in Ceylon ?

It is understood that a German firm's tender to erect a steelworks in Ceylon has been provisionally approved, and that the Swiss expert who visited the island to advise the Government on the project has gone to Germany to discuss technical details with the successful tenderer.

The project has undergone some modification since its original conception; and it is not intended initially to smelt local ore, although this may eventually be done.

Latest Foundry Statistics

The Ministry of Supply announced on July 2 that the production of aluminium castings for April was :— For the sand cast variety, 2,290 tons; for gravity die-castings, 3,665; and for pressure die-castings, 905 tons. The corresponding figures for the first four months were 9,550; 15,824 and 3,896 tons. The production of magnesium castings in April was 255 tons and for the first four months, 1,119.

Personal

MR. R. J. V. WHEELER has been appointed deputy secretary of Newton Chambers & Company, Limited, Thorncliffe, near Sheffield.

MR. TOM HITCHENS has been appointed works manager of Edward G. Herbert, Limited, machine-tool makers, of Levenshulme, Manchester.

MR. GEORGE R. WEBSTER, consulting engineer, is shortly leaving this country for an extended business visit to South Africa and Southern Rhodesia.

MR. H. CUMMINGS, purchasing agent to the South Durham Steel & Iron Company, Limited, and the Cargo Fleet Iron Company, Limited, group of companies, has retired after 47 years' service.

THE GOLD Albert Medal of the Royal Society of Arts has been awarded to Air Commodore SIR FRANK WHITTLE for his work on the development of the continuous-combustion gas-turbine and jet propulsion.

MR. W. YOUNG, formerly sales manager (foundry) of the Clyde Alloy Steel Company, Limited, Motherwell, has resigned his position to join Foundry Services, Limited, as a technical representative in the Scottish area.

THE DIRECTORS and senior executives of British Polar Engines, Limited, Glasgow, recently gave a dinner to mark the 25th anniversary of the service of MR. DAVID BRUCE, the managing director of the Company.

A PRESENTATION has been made to MR. T. R. RICHARDSON, foreman patternmaker of Geo. Clark (1938), Limited, marine engine and boiler makers, of Sunderland, upon his retirement after 52 years with the Company.

FORMERLY Under-Secretary to the Ministry of Works, MR. H. H. MONTGOMERIE has accepted an invitation to join the board of Mackay Industrial Equipment, Limited, Feltham (Middx), in an advisory and consultative capacity.

MR. ROBERT HENDERSON, of Larbert, who celebrated his golden wedding last week with his wife and family, retired six years ago after more than 50 years as a moulder with Jones & Campbell, Limited, Larbert Foundry. He is 78.

MR. D. M. LEWIS is leaving the post of information officer to the Research and Development Division of the British Steel Founders' Association to join the staff of the Aluminium Laboratories, Limited, Banbury (Oxon), as a senior investigator.

MR. F. R. HEAD, who has been appointed manager of the new Lea Works, Luton, of George Kent, Limited, was formerly production controller at the firm's Biscot Road Works. The Lea Works adds 63,000 sq. ft. to the firm's factory floor area.

MR. E. V. BUCHANAN, a director of F. Perkins (South Africa) Proprietary, Limited, accompanied by his wife, arrived at Peterborough last week and undertook a tour of inspection of the Eastfield Works of F. Perkins, Limited, Diesel engine manufacturers. The visitors met MR. FRANK PERKINS, chairman, and other directors of the Company.

MR. JAMES G. ARNOTT has resigned his position as director and foundry manager of the Argus Foundry Limited, Thornliebank, Glasgow, to take charge of the Scottish interests of Coleman-Wallwork Limited, the foundry plant manufacturers of Stotfold, Beds. His office is to be located c/o Acme Welding and Construction Company, Limited, Carlisle Avenue, Hillingdon Industrial Estates, Glasgow, S.W.2. The telephone number is Halfway 1998. Mr. Arnott was president of the Scottish branch of the Institute of British foundrymen a few years ago.

MR. K. C. BOWYER and MR. C. INSCH have just joined the Board of Aga Heat Limited. Mr. Insch, general sales manager, started his working life washing railway engines. From cleaning he went on to driving, selling Aga cookers in his spare time. Later he opened his own kitchen equipment showroom in Blackpool and when opportunity offered became Aga sales representative for North England, next becoming general sales manager. Mr. Bowyer, secretary of the Company, joined as an accountant in 1934, rapidly became office manager and then Company secretary.

THE GENERAL MANAGER of the Steel, Peech & Tozer branch of the United Steel Companies, Limited, Rotherham (Yorks), MR. H. E. WRIGHT, retired last week. He started 38 years ago with the Appleby-Frodingham Steel Company and has been with Steel, Peech & Tozer branch since 1925. He is remaining with the United Steel Companies in a consultative capacity, and will continue to serve on the Boards of the associated companies of which he is at present a director. In addition, he is to supervise the development of commercial research at the head office.

DR. C. J. MILNER, head of the physics section of the research laboratory of the British Thomson-Houston Company, Limited, Rugby, has been appointed to the chair of applied physics at the New South Wales University of Technology, Sydney, Australia, where he will be taking up duty in October. He joined the B.T.-H. research staff in 1936, working in the vacuum physics section under Mr. L. J. Davies—now director of research—mainly on discharge lamps and photo-cells. His wartime activities were on the development of ultra-short-wave klystron and magnetron valves.

PROF. EDMUND GIFFEN, professor of civil and mechanical engineering in the University of London, Queen Mary College, since 1945, has been elected Dean in the Faculty of Engineering of London University for the period 1952-54. Prof. Giffen was with Harland & Wolff, Limited, the Belfast shipbuilding concern, from 1918 to 1927, when he was appointed lecturer and later reader in mechanical engineering at King's College, London. From 1940 to 1945 he was director of research of the Institution of Automobile Engineers. He is a member of the Institution of Mechanical Engineers.

Board Changes

BIRMINGHAM SMALL ARMS COMPANY, LIMITED—Mr. H. P. Potts, managing director of B.S.A. Tools, Limited, has been appointed a director.

S. RUSSELL & SONS, LIMITED—Mr. J. S. Russell and Mr. Samuel Philip Russell are to be made full directors, having served as departmental directors for the past 2½ years.

METALOCK (BRITAIN), LIMITED — Mr. George W. Tremlett has resigned his directorship owing to ill health. Mr. H. A. Paget and Mr. Norman Tinwell have been appointed to the board.

JOHNSON, MATTHEY & COMPANY, LIMITED—Mr. E. G. Pickering has been appointed to the board as a joint managing director. He will fill a vacancy on the board caused by the resignation of Mr. T. Girtin.

BROWN BROS., LIMITED—Mr. B. L. Bisgood has been elected chairman in succession to the late Mr. J. A. Thomson. Sir Richard Yeabsley has been elected deputy chairman, and Mr. J. T. Masterton, who was previously joint managing director, has been appointed managing director.

News in Brief

ARGUS FOUNDRY, LIMITED, plan to extend the pattern store at Argus Foundry, Boydstone Road, Glasgow.

FOSTER TRANSFORMERS & SWITCHGEAR, LIMITED, Wimbledon, will in future be known as Foster Transformers, Limited.

ALUMINIUM ships' lifeboats and light steel vessels are to be built for the first time on the Tweed at Berwick in a new yard to be opened near Spittal.

FELLING FOUNDRY COMPANY, LIMITED, has had plans prepared for the erection of a new staff canteen in Abbotsford Road, Felling, Co. Durham.

THE PROSPECTUS for the session 1952-1953 of the Sir John Cass College is now available on writing to the clerk at Jewry Street, Aldgate, London, E.C.3.

THE ANNUAL GENERAL MEETING of the British Standards Institution will be held on July 23, at 3 p.m., in the council room of the Institution at 24, Victoria Street, London, S.W.1.

ACHESON COLLOIDS LIMITED, manufacturers of Colloidal graphite and other dispersions, have opened a West of England office at 103, Promenade, Cheltenham. Telephone: Cheltenham 3847.

AN AMERICAN FREIGHTER which docked at Hull on Tuesday of last week with 4,334 tons of steel, was unloaded and sent to sea again in three days. This is regarded as one of the quickest ship turn-rounds for some time.

MR. J. D. TANSWELL, chairman of Skipton Urban Council, on Thursday, July 10, opened a new washroom, changing room and messroom which have been provided at the Skipton ironfoundry of David King & Sons, Limited, at a cost of £8,000.

BRITISH STANDARD No. 749:1952 covers the requirements to be associated with underfeed stokers of either the ram or screw type. It is priced at 3s. net and is obtainable from the British Standards Institution, 28, Victoria Street, London, S.W.1.

AS THE RESULT of a recent reorganization, the engineering section of the business carried on by Alfred Sheldon & Sons, Limited, has been formed into a separate Company and will operate as Sheldons Engineering Works, Limited. The premises are at West Street, Wells, Somerset.

JOHN BROWN & COMPANY, LIMITED, Clydebank, have received an order valued at £3,500,000 for two 32,000-ton tankers for the British Tanker Company, Limited. The latter Company have placed orders with British yards for seven 32,000-tonners at a total value of more than £12,000,000.

ORDERS RECENTLY RECEIVED by the National Gas & Oil Engine Company, Limited, Ashton-under-Lyne (Lancs), one of the Brush Aboe group of companies, include 41 Diesel engines for railway applications. Thirty-two of these are for use on New Zealand Government Railways.

DAMAGE WAS CAUSED to the acetylene generating plant at the Openshaw Works, Manchester, of the English Steel Corporation, Limited, last week, when one of the generators exploded. The only damage to the building was to the roof, part of which was blown out. Three men were working in the plant at the time, but no one was injured.

CHANGING MARKET CONDITIONS and restrictions on the shipment of machinery imposed by licensing arrangements in several overseas countries have compelled John Fowler & Company (Leeds), Limited, to put 350 workers at its Doncaster works on a four-day week. Short-time working will probably extend towards the end of the summer.

FORMAL RECOGNITION by the Ministry of Education and the Institution of Mechanical Engineers has now been accorded the special course at the School of Gas Turbine Technology for Ministry of Supply apprentices. As a result, all the apprentices on the course holding Higher National Certificates have now had them endorsed in gas-turbine technology.

AS PART of their policy of diversifying their activities the North British Locomotive Company, Limited, Glasgow, have secured a controlling interest in the London firm of Henry Pels & Company, Limited, makers of light machine-tools. Mr. T. A. Crowe, managing director of the North British Locomotive Company, has become chairman of the newly-acquired subsidiary.

A NEW MACHINE for elevating cases and crates from floor to floor is being manufactured by the British Wedge Wire Company, Limited, of Warrington. Known as the "Wedco" Twin Lift, it requires only half the floor space required by a swing-tray elevator and, operating between gravity roller conveyors, will elevate approximately 720 article per hour with a completely automatic feed and discharge.

AT AN extraordinary general meeting of Cannon Iron Foundries, Limited, Deepfields, Bilston (Staffs), on June 26, it was resolved that the name of the Company be changed to Cannon (Holdings), Limited, and that the capital of the Company be increased to £1,500,000 by the creation of 2,000,000 ordinary shares of 10s. each, ranking *pari passu* in all respects with the existing 600,000 ordinary shares of 10s. each.

PRICE REDUCTIONS of a wide range of oil and petrol engines and agricultural equipment were announced to farmers and industrialists at the opening of the Royal Show last week by R. A. Lister & Company, Limited, agricultural engineers, etc., of Dursley (Gloucester). The reductions apply to all stocks at present held by dealers throughout Great Britain, including Northern Ireland and the Irish Republic.

A STUDENTS' ESSAY PRIZE FOR 1952 has been awarded by the Council of the Institute of Metals to Mr. John C. Wright (student member), laboratory assistant in the development and research department of the Mond Nickel Company, Limited, Birmingham, for an essay on "The Metallographic Investigation of Failed High-temperature Components." The prize is taken in the form of £10 10s. in money and £10 10s. in books.

THE ANNUAL REPORT for 1951 of the Aluminium Development Association, 33, Grosvenor Street, London, W.1, includes this paragraph on castings:—Researches by the British Non-ferrous Metals Research Association involving castings have been reviewed, and the Committee devoted considerable attention to fundamental problems requiring further research. Reviews of current information on foundry production processes have been made with a view to assessing the necessity for further research in this field.

A COMMUNICATION from the Vanton Pump Corporation, Empire State Building, New York, announces the availability of its new line of "flex-i-liner" non-corrosive and non-contaminating pumps for highly-corrosive chemicals. Units are available in capacities up to 20 galls. per min. in discharge pressure ranges from zero to 75 lb. per sq. in. requiring ¼ to 1½ h.p. constant-speed motors. Literature and further technical information can be obtained direct from the New York offices. It is planned that the pump will be marketed through local stockists.

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Pyrolyte High Temperature Cement is made from high grade chrome ore with small additions of other compounds to promote plasticity and air-setting properties. It has a very high melting point (1730° C.) and is chemically neutral. Pyrolyte is used for jointing all types of bricks including chrome-magnesite, chrome, aluminous firebricks, etc. and for cold patching gas retorts and coke oven linings.

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Raw Material Markets

Iron and Steel

The blast furnaces now in operation are maintaining improved pig-iron outputs. The tonnage of coke received by the furnaces has been increasing. Given sufficient ore and coke supplies, there are good prospects of a further expansion in pig-iron production.

Although impressive deliveries of basic pig-iron have been made to the steelworks, their requirements are far from being satisfied and will continue to predominate while scrap supplies are so scarce and irregular, necessitating a much larger proportion of pig-iron in their mixtures. The Minister of Supply in his appeal to steel consumers to intensify the scrap drive stated that there was no prospect of obtaining increased imports of scrap from abroad. This deficiency can only be made good by the substitution of pig-iron, which, fortunately, is being supplied in increasing quantities from the furnaces already in blast and by the blowing in of fresh units.

The foundry trades continue to take up all the pig-iron they can acquire, and there would be no difficulty in disposing of outputs from furnaces now in blast, as well as from fresh units, if these could receive sufficient supplies of coke to enable them to be blown in. The engineering and speciality foundries are well employed, and are demanding larger tonnages of pig-iron. Low- and medium-phosphorus irons are in short supply and hematite, although easing slightly, is still very scarce. The refined-iron makers are still tied to reduced outputs by shortage of raw materials. The jobbing and light foundries have sufficient work to utilize all the high-phosphorus pig-iron available.

Foundry coke is being received in quantities barely sufficient for current consumption, leaving little for reserve. The meagre stocks of pig-iron, scrap, and coke are the cause of much anxiety. Ganister, limestone, and firebricks are received to requirements, while ferro-alloys are generally available in the required quantities and grades.

Although export business in semi-finished steel has slackened, there is no relaxation in the demand from home consumers and stockists for the products of the re-rollers. Home steelworks are sending forward all the steel semis they can spare, and some deliveries are coming to hand from oversea.

Non-ferrous Metals

The price of electrolytic copper has been increased from £281 to £287 per ton, delivered consumers' works. The new price took effect on Saturday last. Announcing the change, the Ministry of Materials stated that discounts and premiums remained unchanged and that the Ministry of Supply would make corresponding adjustments in the controlled prices of scrap and secondary metal. The price increase follows the conclusion of a further round of negotiations between the Ministry of Materials and the Commonwealth suppliers. A meeting has now been arranged between the Ministry and the suppliers to discuss future pricing.

Early last week a statement was made relative to the Ministry's plans for sales of August copper. It will be remembered that the regulations lay it down that copper may be bought for the current and immediately following month. At the end of June, therefore, users could secure copper for delivery only one month ahead. Moreover, bearing in mind that the majority of users probably bought their July metal before the £50 rise, they were left in the unfortunate position of not being able to cover any sales. However, fortunately, the Ministry decided to continue selling in the early days of July at £281 for the August position pending a decision in the talks taking place with the producers. A report appeared in the Press that there might be a price published, effective up to the middle of July, which seems to suggest that, as in France, changes may be made fortnightly instead of monthly. What is wanted badly, of course, is stability in the copper quotation, but preferably at a lower level than £281, which is an all-time high record. Scrap prices have been adjusted to the new copper level and a moderate business has been passing, but consumers are buying cautiously. But they will require to be altered again now that copper has advanced by a further £6 to £287.

There was a price advance on July 1 of £3 in aluminium, the current quotation being £157 per ton. This time last year the level was £124 and we have had actually three increases since Christmas—£24, £6, and now a further £3. Some increase was also made in the extras for quality. It is presumed that the last two rises in the aluminium price have been made necessary by the improvement in the Canadian exchange, which has appreciated considerably *vis-á-vis* both the £ and the $. From time to time warnings are given to the country by the Government that it may prove necessary to cut imports into the United Kingdom still further. Actually, of course, action has already been taken on these lines, but, so far, there has been little or no interference with essential raw material. In this category aluminium certainly comes, for its use is vital in aeroplane construction and, indeed, for many other purposes also. In the not far distant future we shall see a marked increase in the world's production of this metal, for both the United States and Canada have plans for ambitious expansion of existing facilities. Schemes are afoot also in the sterling area, but these are likely to be longer term than those in the dollar areas.

Tin quotations on the London Metal Exchange were:

Cash.—Thursday, £969 15s. to £970; Friday, £969 to £970; Monday, £969 10s. to £970; Tuesday, £969 10s. to £970; Wednesday, £970 to £970 10s.

Three Months—Thursday, £966 15s. to £967; Friday, £967 to £967 10s.; Monday, £966 5s. to £966 10s.; Tuesday, £966 10s. to £967 10s.; Wednesday, £967 10s. to £968.

Publication Received

Vermiculite, by E. R. Varley, Ph. D. Published on behalf of the Mineral Resources Division of the Colonial Geological Surveys by H.M. Stationery Office, York House, Kingsway, London, W.C.2. Price 7s. 6d. net.

This mineral, which is of considerable interest in foundry practice, is covered in the most detailed form in this monograph. It seems that about 5,000 tons are imported annually, but as the general classification is mica, current statistics are not too exact. There are no commercial deposits in this country, but there are treatment plants in existence. In the main, it is to-day an import from dominion or colonial sources. The monograph should be included in the libraries of the larger foundries as vermiculite is for them a raw material of increasing importance as an insulator in the making of moulds and cores. It can be obtained on application to H.M. Stationery Office.

Latest Foundry Statistics. According to the British Bureau of Non-Ferrous Metal Statistics, the production of pure copper castings is as usual stated to be 500 tons for the month of May. The production of brass and bronze castings during this month was 6,570 tons and for the first five months of the year 30,687 tons as against 25,829 tons for the same period of last year.

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Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered, unless otherwise stated)

July 9, 1952

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £13 1s. 6d.; Birmingham, £12 15s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £13 17s. 6d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent P, up to 3 per cent. S), d/d within 60 miles of Stafford, £15 5s. 9d.

Scotch Iron.—No. 3 foundry, £14 4s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £17 4s. 6d.; South Zone, £17 7s.

Refined Malleable.—P, 0.10 per cent. max.—North Zone £17 14s. 6d.; South Zone, £17 17s.

Cold Blast.—South Staffs, £18 7s.

Hematite.—Si up to 2½ per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. Coast and N.-W. Coast of England, £13 11s. 6d.; Scotland (Scotch iron), £13 18s.; Sheffield, £14 9s. 6d.; Birmingham, £14 17s. 6d.; Wales (Welsh iron), £13 18s.

Basic Pig-iron.—£12 10s. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered.)

Ferro-silicon (6-ton lots).—40/55 per cent., £57 10s., basis 45% Si, scale 21s. 6d. per unit; 70/84 per cent., £86, basis 75% Si, scale 23s. per unit.

Ferro-vanadium.—50/60 per cent., 20s. 6d. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 10s. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £204; ditto, copper-free, £212.

Ferro-tungsten.—80/85 per cent., 29s. 9d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 32s. 9d. per lb. of W.

Ferro-chrome (6-ton lots).—4/6 per cent. C, £85 4s., basis 60% Cr, scale 28s. 3d. per unit; 6/8 per cent. C, £80 17s., basis 60% Cr, scale 26s. 9d. per unit; max. 2 per cent. C, 2s. per lb. Cr; max. 1 per cent. C, 2s. 2½d. per lb. Cr; max. 0.15 per cent. C, 2s. 3½d. per lb. Cr; max. 0.10 per cent. C, 2s. 3¾d. per lb. Cr.: max. 0.06 per cent. C, 2s. 4d. per lb. Cr.

Cobalt.—98/99 per cent., 20s. per lb.

Metallic Chromium.—98/99 per cent., 6s. 5d. to 6s. 9d. per lb.

Ferro-manganese (blast-furnace). — 78 per cent., £43 15s. 2d.

Metallic Manganese.—93/95 per cent., carbon-free, £262 per ton.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £25 4s. 6d.; tested, 0.08 to 0.25 per cent. C (100-ton lots), £25 14s. 6d.; hard (0.42 to 0.60 per cent. C), £27 12s.; silico-manganese, £33 8s.; free-cutting, £28 8s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £31 9s.; case-hardening, £31 17s.; silico-manganese, £34 9s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £29 8s.; basic, hard, over 0.41 up to 0.60 per cent. C, £30 8s.; acid, up to 0.25 per cent. C, £31 17s.

Sheet and Tinplate Bars.—£25 3s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £29 14s.; boiler plates (N.-E. Coast), £31 1s. 6d.; chequer plates (N.-E. Coast), £31 3s.; heavy joists, sections, and bars (angle basis), N.-E. Coast, £27 17s.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £31 15s. 6d.; flats, 5 in. wide and under, £31 15s. 6d.; hoop and strip, £32 10s. 6d.; black sheets, 17/20 g., £40 12s. 6d.; galvanized corrugated sheets, 17/20 g., £54 4s.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £50 18s. 3d.; nickel-chrome, £71 6s. 9d.; nickel-chrome-molybdenum, £78 14s.

Tinplates.—57s. 1½d. per basis box.

NON-FERROUS METALS

Copper.—Electrolytic, £287; high-grade fire-refined, £286 10s.; fire-refined of not less than 99.7 per cent., £286; ditto, 99.2 per cent., £285 10s.; black hot-rolled wire rods, £296 12s. 6d.

Tin.—Cash, £970 to £970 10s.; three months, £967 10s. to £968; settlement, £970

Zinc.—G.O.B. (foreign) (duty paid), £130; ditto (domestic), £130; "Prime Western," £130; electrolytic, £134; not less than 99.99 per cent., £136.

Lead.—Good soft pig-lead (foreign) (duty paid), £137; ditto (Empire and domestic), £137; "English," £138 10s.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £150 15s.; rolled zinc (boiler plates), all English destinations, £148 15s.; zinc oxide (Red Seal), d/d buyers' premises, £151.

Other Metals.—Aluminium, ingots, £157; magnesium, ingots, 2s. 10½d. per lb.; antimony, English, 99 per cent., £225; quicksilver, ex warehouse, £65 to £65 10s.; nickel, £454.

Brass.—Solid-drawn tubes, 27⅝d. per lb.; rods, drawn, 37⅝d.; sheets to 10 w.g., 31⅞d.; wire, 33½d.; rolled metal, 30½d.

Copper Tubes, etc.—Solid-drawn tubes, 32⅝d. per lb.; wire, 320s. per cwt. basis; 20 s.w.g., 348s. 6d. per cwt.

Gunmetal.—Ingots to BS. 1400—LG2—1 (85/5/5/5), £230 to £270; BS. 1400—LG3—1 (86/7/5/2), £250 to £280; BS. 1400—G1—1 (88/10/2), £363 to £400; Admiralty GM (88/10/2), virgin quality, £335 to £350 per ton, delivered.

Phosphor-bronze Ingots.—P.Bl, £365 to £425; L.P.Bl, £300 to £335 per ton.

Phosphor Bronze.—Strip, 44¼d. per lb.; sheets to 10 w.g., 46½d.; wire, 49⅞d.; rods, 45d.; tubes, 43½d.; chill cast bars: solids 4s. 5d., cored 4s. 6d. (C. CLIFFORD & SON, LIMITED.)

Nickel Silver, etc.—Ingots for raising, 2s. 9¾d. per lb. (7%) to 3s. 10½d. (30%); rolled metal, 3 in. to 9 in. wide × .056, 3s. 3¾d. (7%) to 4s. 4½d. (30%); to 12 in. wide × .056, 3s. 4d. to 4s. 4¾d.; to 25 in. wide × .056, 3s. 6d. to 4s. 6¾d. Spoon and fork metal, unsheared, 3s. 0¾d. to 4s. 1½d. Wire, 10g., in coils, 3s. 10½d. (10%) to 4s. 10½d. (30%). Special quality turning rod, 10%, 3s. 9½d.; 15%, 4s. 2½d.; 18%, 4s. 6¾d. All prices are net.

Obituary

MR. JAMES D. COWAN, chairman of Fleming & Ferguson, Limited, shipbuilders, of Paisley (Renfrew), and a director of several other companies, died recently at the age of 70.

MR. RAYMOND GREGORY JONES, who had served the Hydraulic Engineering Company, Limited, Chester, for 34 years, being appointed secretary to the Company in 1949, has died at the age of 49.

THE DEATH on June 29 is announced of MR. ARTHUR J. BURN, managing director of the Llanelly Foundry & Engineering Company, Limited, since the inception of the Company in 1919. Prior to this he acted in the same capacity for very many years with the Waddle Patent Fan Company, Limited.

THE DEATH occurred recently at the age of 72 of MR. JOHN WHARTON, senior director of Joseph Wharton & Son (Maryport), Limited, engineers and ironfounders, of Maryport (Cumberland). He was a member of the North of England Ironfounders' Association and chairman of the Border Counties' group of the British Employers' Confederation.

MR. ROLAND HERBERT OXLEY, who was a director of American Machine & Foundry Company, food, tobacco, and cigarette machinery manufacturers, of London, N.1, Hercules Powder Company, Limited, coreoil manufacturers, of Erith (Kent), and Kelvinator, Limited, makers of domestic and industrial refrigerators, of London, W.C.1, died recently.

THE DEATH is announced of MR. C. LESLIE FRY, a local director of Thos. W. Ward, Limited, Sheffield, on June 26, while on holiday in the Scilly Isles. He was 52. Mr. Fry, who was unmarried, joined the firm on leaving school and had been with them for 38 years. He was also joint managing director of Low Moor Best Yorkshire Iron, Limited, joint assistant managing director of the Wolverhampton Steel & Iron Company (1946), Limited, and a director of Birchley Rolling Mills, Limited.

Recent Wills

BOTTERELL, P. D., a former chairman of Bell's Asbestos & Engineering, Limited, Slough (Bucks) £102,113

BEERE, O. G. R., formerly a director of the Selson Machine Tool Company, Limited, London, S.W.1 £20,800

MULLINGS, W. J., managing director of Priest & Mullings, Limited, constructional and mechanical engineers, of Bristol £54,870

TROTT, THOMAS, formerly chairman and managing director of Thomas Andrews & Company, Limited, steel manufacturers, of Sheffield £12,807

GRAFF-BAKER, W. S., late chief mechanical engineer (railways) of London Transport, and a former president of the Institution of Locomotive Engineers £10,768

BATTY, G. H., an export representative of Firth-Vickers Stainless Steels, Limited, Sheffield, formerly the company's deputy export manager at Sheffield £4,707

MACQUISTEN, A. P. S., formerly for many years secretary and director of Stewart (Duncan) & Company, Limited, hydraulic and steelworks engineers, of Glasgow £21,699

CALLANDER, SIR JAMES, a former general manager of the Barrow-in-Furness (Lancs), works of Vickers-Armstrongs, Limited, and at one time on the staff of the Mersey Docks and Harbour Board £76,951

WARD, CYRIL, a director and secretary of B. Huntaman, Limited, steel manufacturers, of Sheffield, and of John Cooper & Son, Limited, press tool manufacturers, of Sheffield, and vice-president of the Crucible Steel Makers' Association £2,307

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CLASSIFIED ADVERTISEMENTS

PREPAID RATES: Twenty words for 5s. (minimum charge) and 2d. per word thereafter. Box Number, 2s. extra (including postage of replies).

Advertisements (accompanied by a remittance) and replies to Box Numbers should be addressed to the Advertisement Manager, Foundry Trade Journal, 49, Wellington Street, London, W.C.2. If received by first post Tuesday advertisements can normally be accommodated in the following Thursday's issue.

SITUATIONS WANTED

FOUNDRY MANAGER, A.M.I.B.F. (30), desires position. Accustomed to high pressure non-ferrous work. Practical and technical. Good organiser and disciplinarian.—Box 1905, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER, A.M.I.B.F., of well known company, open to consider post in similar capacity or as technical representative. Extensive experience in jobbing, mechanized, permanent moulds, and "C" Process. Capable of full control. Box 1902, FOUNDRY TRADE JOURNAL.

METALLURGIST (28), L.I.M., H.N.C., wide experience cast and malleable iron founding, non-ferrous, cupola and sand control, all types laboratory work, capable moulder, accustomed full control, desires post in West Midlands or elsewhere, if accommodation available for wife. All replies acknowledged.—Box 1913, FOUNDRY TRADE JOURNAL.

SENIOR TECHNICAL EXECUTIVE, Foundry and Metallurgical, F.I.M., M.I. & S.I., M.I.B.F., also member American Foundrymen's Society, now in Australia, in consultative capacity, returning to Britain this year, requires Industrial or Educational appointment. 30 years' experience, ferrous and non-ferrous alloys, particularly mechanised production of grey iron, malleable and non-ferrous castings, including foundry and laboratory layouts, plant, equipment, technical control, etc. Technical education experience—lecturing, supervision and advisory.—Box 1903, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 *inclusive or a woman aged* 18-59 *inclusive unless he or she, or the employment, is excepted from the provisions of the Notification of Vacancies Order* 1952

APPLICATIONS are invited by old-established Company for the position of FOUNDRY MANAGER. Applicants (35/45) should have sound technical and practical knowledge necessary to manage a light castings foundry on production of R.W. and Soil Goods and general castings produced by machine and floor methods. Good company's house available.- Applicants please give full details of past experience, present position, age, salary required, references, etc., in confidence, to SLOAN & DAVIDSON, LTD., Stanningley, Leeds.

K. & L. STEELFOUNDERS and ENGINEERS LIMITED, have a vacancy in their Steel Foundry Division for a Mechanical and Metallurgical Graduate between 30 and 35 years of age. The position will carry a good salary and offers opportunity for rapid advancement. Housing accommodation will be provided if necessary. Applications are invited from men who are prepared to make their career on the production side of a large modern steel foundry. Previous experience not essential as adequate training will be given where required. Full details in confidence to Development Director, K. & L. STEELFOUNDERS AND ENGINEERS LIMITED, Letchworth.

SITUATIONS VACANT—*Contd.*

TRAVELLER WANTED for the sale of protective clothing. Must have sound connection. London man preferred. Write to J. MOON & SON, 94, Sclater Street, London, E.1.

MOULDERS. Jobbing Moulders required for iron Foundry; rate 3/6d. per hour, plus £2 week bonus, plus merit bonus. Also all classes of Foundry labour. P.M.A., 136, Bramley Road, W.10. LAD. 3692.

APPLICATIONS are invited from highly qualified and experienced persons for the following posts in a mechanised as well as jobbing Steel Foundry in Calcutta, India. The foundry produces a wide variety of Steel Castings up to 7 tons finished weight for Railway Locomotives, Wagon and Coaching underframe, Cement, Sugar and other industries. It is very well equipped with modern equipment such as Sand Slinger, Moulding Machines, Core Blower, Sand Conditioning System, Laboratory, etc. Both green and dry sand methods are used.

1. FOUNDRY ENGINEER: He should have a very sound knowledge of Methoding, Planning and Progressing in Drawing Office, Pattern Shop, Moulding Shop, Core Making Shop, Heat Treatment and Fettling Shop; in fact all the operations connected with the production of castings except steel making and machining. Experience in a similar capacity in any large Steel Foundry in United Kingdom or European Continent essential. Should be a good Organiser and Administrator. Pay up to Rs. 2,500 per month, depending upon qualifications subject to income tax. Free furnished quarters and transport to and from works. Three years' contract, with free passage for self and wife to and from India.

2. FOUNDRY PRODUCTION MANAGER: He should have a very sound knowledge of Moulding, Core Making, Sand Control and Pattern Making by latest methods. Should be able to take charge of actual production in Moulding, Pattern and Core Making Shops. Previous experience and good organising and administrative ability and ability to train men is essential. Knowledge of quality and cost control is also required. Pay up to Rs. 2,000 per month, depending upon qualifications, and subject to income tax. Other terms as for first post.

Applications should be addressed to M/s. BHARTIA ELECTRIC STEEL CO., LTD., 42, Shibtolla Street, Calcutta, 7, India, and copies of the same must be forwarded to Company's Works Manager, Mr. N. G. Chakravarti, c/o Mrs. Phyllis Dalrouski, 154, Oakbrook Road, Sheffield, 11, England, who will interview suitable candidates after 15th July, 1952, in Sheffield.

SITUATIONS VACANT—*Contd.*

FOUNDRY FOREMAN, age 30/35, experienced in ferrous and non-ferrous machine moulding practice, required for Middlesbrough foundry.—Box 1904, FOUNDRY TRADE JOURNAL.

ASSISTANT FOREMAN MOULDER wanted for Heavy Foundry on lower reaches of the Clyde. Box 1910, FOUNDRY TRADE JOURNAL.

PROGRESSIVE Company of Pattern Makers and Non-Ferrous Founders-South London district—require live go-ahead Pattern Shop Foreman, used to modern production methods. Would also be required to take charge of small foundry at a later date. Excellent prospects for ambitious man. Write stating qualifications and salary required to Box 1911, FOUNDRY TRADE JOURNAL.

PATTERN MAKER. Vacancy for one experienced man capable of making Master Patterns and setting up intricate metal patterns. Permanent situation advancement and experience in a modern well equipped shop. Modern flat available for suitable applicant.—G. PERRY & SONS, LIMITED, HALL LANE, LEICESTER.

HEAD, WRIGHTSON & COMPANY, LIMITED. Methods Engineer wanted for supervising heading and gating steel and alloy castings. Apply stating age, full details of experience and salary required to PERSONNEL MANAGER, TEESDALE IRON WORKS, THORNABY-ON-TEES.

SKILLED MOULDERS required for Jobbing Foundry. Good piece-work rates, canteen facilities and sports club. Slough Foundries Limited, Buckingham Avenue, Slough.

WANTED.—SUPERINTENDENT for Light Metal Foundry. Fully experienced in gravity and sand, to take charge of progressive foundry in North-West. Good opportunity for right man. Please reply in confidence, stating experience and salary. Accommodation can be arranged.—Box 1890, FOUNDRY TRADE JOURNAL.

CHEMIST OR METALLURGIST with knowledge of chemistry and physics required for sand control in Cylinder Foundry (Midlands). Up-to-date laboratory existing. Staff Pension Scheme operating. State age, experience and salary required. Box 1893, FOUNDRY TRADE JOURNAL.

QUALIFIED METALLURGICAL CHEMIST required, to take charge of Foundry Laboratory. Practical experience in Grey Iron Foundries essential. Knowledge of chilled iron processes desirable.—Write, stating age, experience, and salary required, to PERSONNEL OFFICER, E. R. & F. Turner, Ltd., Ipswich.

REPRESENTATIVES required, on commission basis, by Non-ferrous Founders and Pattern Makers. Men engaged in closely-allied products not objected to.—Write Box 1891, FOUNDRY TRADE JOURNAL.